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ABSTRACT

This research study involved a systematic investigation into the relationships among: (1) the techniques used by search analysts during preliminary interviews with users before engaging in online retrieval of bibliographic citations; (2) the amount of new information gained by the user as a result of the search; and (3) the user's ultimate satisfaction with the quality of the items retrieved. A series of controlled experiments, which involved two search analysts (Canadian university librarians) and 150 users, were conducted to explore the effects of two interview techniques: the conscious use of "open" and "closed" questions, and the use of pauses of different lengths by search analysts during the online negotiation interviews. Analytical techniques included two-way analysis of variance and path analysis of data. Among the findings were the following: the asking of open and closed questions had a modest effect on the amount learned by users; the type of pause did have a significant effect on the amount clients learned; the average user's satisfaction was higher when open questions were asked; overall satisfaction was lower when moderate pauses were used; those learning most about their topic were, overall, more satisfied than those who learned less; and those placing high importance on the information obtained tended to have lower satisfaction scores. (Author/ESR)

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Search Interview Techniques, Information Gain, and User Satisfaction with Online Bibliographic Retrieval Services

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ABSTRACT

The purpose of this research study was to undertake a systematic investigation into the relationships among: (1) the techniques used by search analysts during preliminary interviews with users before engaging in online retrieval of bibliographic citations; (2) the amount of new information gained by the user as a result of the search; and (3) the user's ultimate satisfaction with the quality of the items retrieved. A series of controlled experiments were conducted to explore the effects of two interview techniques: the conscious use of "open" and "closed" questions and the use of pauses of different lengths by the search analyst during the online negotiation interview. Data were collected on various aspects of the user's need for information, the value he/she placed upon new knowledge, and the consequences of inadequate information. Analytical techniques included two-way analysis of variance and path analysis. While search analysts displayed no difficulty in asking open and closed questions, they found considerable difficulty in controlling the lengths of pauses. Among the findings were the following: the asking of open and closed questions had a modest effect on the amount learned by the users; the type of pause did have a significant effect on the amount clients learned; average users satisfaction was higher when open questions were asked; overall satisfaction was lower when moderate pauses were used; those learning most about their topic were, overall, more satisfied than those who learned less; those placing high importance on the information obtained tended to have lower satisfaction scores.

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Next we would like to acknowledge the help of all those users who allowed their negotiation interviews to be taped and subsequently answered and returned evaluation questionnaires concerning their searches.

The research officer and graduate assistant on the project were instrumental in carrying out the many day-to-day details of the study. In the earlier stages, E. Blaine Currie analyzed many of the taped interviews, coded questionnaire data, and provided liaison with the search analysts and their users. David To was responsible for the final stages of the data analysis. We are grateful to them both for the consistent and devoted application of their expertise.

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Elaine Tanenzapf deciphered our manuscripts, typed revisions, and produced the final version of this report with efficiency and good humour.

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PREFACE

The research described in this report took place over a three year period from September 1979 through October 1982. The activities that occurred during that time took place approximately as follows. During the first year staff were hired, instruments were constructed, pre-tested and revised, analysts were trained, control data collected, and experimental treatments embarked upon in the field settings. The administration and completion of the open-closed questions and no pause-moderate pause experiments took place over an eighteen month period. Soon after the beginning of the experiments, data collection and coding began and continued until the end of the second year. The third year saw the analysis of the data and the preparation and writing of this final report.

A word of explanation about the organization of the report is in order. During the course of the study much developmental work was undertaken to ensure that the items and instruments used would in fact measure what we wished them to. Their reliability and validity were assessed and methods were devised to analyze taped negotiation interviews. Descriptions of the procedures we developed, preliminary findings and implications were reported to the professional community at the annual meetings of the Canadian Association for Information Science, 1981 and 1982. While these papers are developmental, they nevertheless contain much that is valuable in a field where there is a paucity of hard data. Therefore, we felt that they should be included as part of our final report. They constitute Parts III and IV.

While on the one hand our work breaks new ground in the approach it takes and the analytical procedures developed, it nevertheless treats an area--the negotiation interview--that is well grounded in a rich scholarly tradition, that of the interview in traditional reference work. A substantial body of this literature was reviewed as well as that treating computer-based reference services. We felt that a thorough review of both these areas was necessary to enable us to understand the present state of knowledge in the field and thereby attempt to extend it. This substantial review of the literature constitutes Part II of this report.

Finally, the main thrust of the research is described in Part I. Each Part, though self-contained and complete in itself, contributes to form a comprehensive picture of our work over the past three years.

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PART I

INTERVIEW TECHNIQUE AND USER SATISFACTION WITH ONLINE BIBLIOGRAPHIC RETRIEVAL

In this part of the report are described the results of two field experiments that were conducted to determine the impact of different interview techniques on the satisfaction of users with the results of on-line bibliographic searches. Each experiment involved two search analysts (specially trained reference librarians), each located in a special library serving a faculty of education. The first experiment involved asking different types of questions ("open" and "closed"); the second involved the use of pauses of different lengths ("no" pause and "moderate" pause). In addition to the experimental and criterion or output variables, several other variables--in particular, the amount learned as the result of conducting an online bibliographic search--were measured in order to understand the antecendents of user satisfaction. A framework drawn from the field of the economics of information was used to guide the selection of these variables.

Background

The topic of the present study was suggested by the conclusions of a previous study by the authors (Lawton, Auster and To, 1979), in which we developed a systems model to be used in the evaluation and analysis of online bibliographic search services. The model, which was applied to the Educational Information Systems for Ontario (EISO), involved nine variables: method of contact (in person or phone), system used (SDC or Lockheed), turnaround time, connect time, strategy time, citations printed, price, amount learned by the user , and user satisfaction. The last variable, satisfaction, had five subscales: satisfaction with publicity material and directions, with the convenience of the service and helpfulness of the search analyst, with the timeliness of the service, with the quality of the technology, and with value of the bibliography and materials.

Path analysis was used to analyze the evaluation data. This approach allows one to test the validity of causal inferences for pairs of variables while controlling for the effects of other variables (Nie, et al. 1975; Lawton, et al. 1979).

In conclusion, we noted first that only one variable had a consistent effect on satisfaction, namely price. We cautioned,

> In interpreting this differential effect of price, it must be...[noted] that 9% of all users received free searches and most others paid $30 or more. It would appear then that when individuals are paying for bibliographic search [sic], they expect more in the way of service than they would if they were receiving it for free. Yet, it is important to note that their expectations with regard to service do not carry over to their assessment of the value of the goods , which they apparently assess independently of amount paid (p.39).

A second variable, the amount learned about the topic searched, was also related to various satisfaction (subscale) scores with some consistency:

> This variable is an output variable in its own right, but intervenes between satisfaction and all process variables except price. It is positively related to overall satisfaction, satisfaction with timeliness of service, and, most important, satisfaction with the bibliography and materials...[This] highlights the idea that the client is motivated to learn and that if this learning does not occur dissatisfaction will result (p.39).

Though the amount a user learned about his or her topic proved to be an important intervening variable in explaining user satisfaction, none of the process variables--method of contact system used, strategy time, connect time, turnaround time, or number of citations printed--helped to account for the learning that took place. In conclusion, we noted:

> It would appear that explanations [of the amount learned] must be sought in the personality or knowledge of the client, the interaction between the client and search analyst, the quality of the search strategy, or the topic being searched. (p.39)

A second, exploratory, study refined our understanding of the interaction which took place during the search interview (Auster and Lawton, 1979). Findings suggested a model of the process with three component strands--the behaviour of the client, the questioning techniques of the search analyst, and the topic of the search itself. The search analyst's methods included her use of empathy and non-verbal expression, open and closed questions, and a loose structuring of the interview into five stages. On the user's part, it appeared that his or her stock of knowledge, ability to express the content and type of information needed, and the value placed upon this information were the important variables.

Interview Techniques

The purpose of the interaction between the search analyst and the user is for the former, with his or her knowledge of retrieval systems and data bases, to elicit information from the latter that can be translated into adequate search strategies for querying the data bases via search systems available (Atherton and Christian, 1977). The exploratory study suggested a number of factors that might explain the "success" of a given negotiation process. The literature on interview techniques suggested many others that might also be considered (Richardson, 1965). Some of these appear to be more important than others, and some more manipulable than others.

Two specific techniques that appeared salient in both the literature and the exploratory research were the type of question used and the "pace" of the interview.

A fundamental distinction in types of question is that of open versus closed questions. Open questions are those which are general in nature and that do not suggest a specific category of response. Closed questions, in contrast, require only one or several words in response, usually of a categorical nature--a name, a number, yes or no, and so on. For example, "What is your educational background?" is an open question; "What degrees do you hold?" is a closed question. Sometimes, phrasing may vary, however, and judgement is necessary; e.g., "Would you tell me about your educational background?" is clearly "open" in intent, though it can, technically, be answered by a yes or no.

The literature on interview techniques suggests that open questions elicit longer responses that reveal more information about the interviewee's understanding--or "map"--of the world, than do closed questions. The latter tend to demand that the interviewees be fit into the categories present in the interviewer's mind. Responses tend to be short, though interviewees may take it upon themselves to explain their answers and thereby avoid the categories implicit in the question.

The "pace" of the interview, though not identified specifically in our research, was a factor suggested by the tendency we noted for the search analyst to dominate the direction of the interview, sometimes cutting off the interviewee in order to proceed to the next item on his or her "agenda". The literature suggests that the ability of the interviewer to pace the interview--by allowing pauses of different lengths to occur--can affect the content of the interviewee's responses. In particular, allowing no pauses or extremely long pauses (over 10 seconds) tends to reduce the responsiveness of interviewees. The first because they cannot get a word in edge wise (the phenomena we perceived), and the second because long pauses apparently suggest to the interviewees a termination of interest by the interviewer and not just a pause in expectation of a response.

Both of these factors--types of questions used and use of pauses--appeared both important and trainable; i.e., a search analyst could, it appeared, be coached in the techniques. Other techniques in the literature or that we had noted--e.g., empathy and non-verbal communication--seemed more difficult to affect, more difficult to measure, and possibly of less importance.

Economics of Information

The notion that information has value suggests that the perspectives represented by the economics of information (Levin, 1980; Stiegler, 1961) and decision theory (Edwards, 1963; Sudman, 1976) may help in explaining a user's satisfaction with the results of a bibliographic search. As Levin notes, the key idea behind these frameworks is that information has both a cost and a benefit:

> The benefit that is attributable to information derives from its value in improving decision making and resultant outcomes. For example, the consumer who finds in an advertisement that he can purchase an item that he needs at a reduced price will receive benefit from that information that is equal to the price reduction. The cost of information refers to the resources required to collect, analyze, and disseminate it as well as the cost to the user of acting on it. Such costs include not only pecuniary ones that we can find on accounting statements, but also such "non-accounting" costs as the information user's time...(p. 7)

Levin provides a straightforward example of a person seeking a new car who visits a local automobile agency to ascertain prices.

> He selects a particular model that will satisfy his needs, but he decides to think about it before buying it. Outside of the automobile agency, he purchases a newspaper and turns to the auto section. There he finds that he can obtain the same model for $200 less, but the agency is 10 miles away. He returns to the automobile agency and shows them the advertisement, and they agree to reduce the price by $200 to make the sale. For the relatively nominal cost of the newspaper and the value of the man's time, he was able to receive a benefit of $200.

Sudman (1976) indicates two factors that affect the value of information: (1) the degree of uncertainty, and (2) the nearness of the decision maker's prior expectation to the decision point.

> If his prior expectation is far higher or lower than the break-even point, there will be little or no value to the information, even if there is a high degree of uncertainty [and hence a great need for information]. On the otherhand, if the prior expectation is near the break-even point, information may be very valuable even with little uncertainty. (p.93)

In the case of Levin's automobile purchaser, we must infer that the initial price quotation was higher than the shopper's prior expectation; otherwise he would have purchased the car. Had the expectation been much lower--several thousand dollars--the additional information would have been worthless. As it was, a single piece of information was of considerable value, suggesting that he was very near to his break-even point in assessing the worth of the car to him as opposed to the other uses to which the money might be put.

It would appear that this same logic would apply in the case of at least some users of a bibliographic search service. For example, a user who is a professional educator undertaking an evaluation of a language arts program could face a decision concerning the creation of a new evaluation instrument, at considerable expense, or the adoption of an existing one. Information about similiar evaluation projects could provide information that would reduce the educator's uncertainty, and hence aid in making a decision.

There are other approaches to the issue of assessing the worth of information, however. Woodward (1980) argues that much information is used solely for cognitive purposes--learning new ideas, reconstructing old ones, etc. In this case, the information has no economic value. Still, it can be assumed that the individual has some prior knowledge, is seeking additional information, and that the information is important to the user who places some valuation upon it.

The Problem

This study, then, places the search for information within the context of the economics of information. The search interview is looked upon as a controllable process within the overall process that comprises the online bibliographic retrieval cycle--from the user's initial contact with a search service to his or her final assessment of the bibliography and materials obtained as a result of the search. An intermediate product of the search process, the amount a client learns about his or her topic, is viewed as a key intervening variable which, in the end, will account for much of the variation in satisfaction.

Two specific questions are asked:

1. What are the relationships among various interview techniques (type of questions and length of pauses), the amount learned by the user, and the user's satisfaction?

2. What are the relationships among the user's prior knowledge of the topic, amount of information gained, assessment of the importance of the information sought, and satisfaction with the search results?

The first question arises from the analysis of the interview process and the review of literature on the topic. Implicit within the question is a chain of relationships linking interview technique to the amount learned, and the latter with user satisfaction. In suggesting these linkages, four assumptions are made:

1. that the user's responses to the search analyst's questions are related to the type of questions asked;
2. that the content of the search strategies developed by the analyst are related to these responses;
3. that the citations retrieved are closely related in content to the search strategy used; and
4. that the information gained by the user is related to the content of the citations received.

Evidence will be cited that supports the validity of each of these assumptions.

The second question is suggested by the economics of information perspective and the factors suggested by Sudman--uncertainty and nearness of prior expectations to the decision point. In particular, it is assumed that the extent of an individual's prior knowledge reflects uncertainty, that the amount of information gained reflects the reduction in uncertainty and that a post facto assessment of the importance of the information retrieved or missed indicates how close the individual is (or was) to the decision point.

Implicit in the question is the proposition that the greater the reduction in a user's uncertainty (i.e., gain in knowledge) and the nearer he or she was to the decision point (i.e., the greater the importance placed on the information retrieved), the greater will be the person's satisfaction. Satisfaction, therefore, would probably be greatest when both the amount learned and the importance of the information were both high, and lowest when both of these factors were low. In the two intermediate cases--a little information that is of high value, or an extensive amount of information that is of little value--one would expect middle levels of satisfaction. And of these two, one would expect higher satisfaction in the first case since the information was important; i.e., it appears that being near the break-even point is more important in explaining satisfaction than reducing uncertainty. As in the case of the car purchaser previously described, a little information was of considerable value because the purchaser was near the decision point.

If the preceding analysis is correct, then it is possible to hypothesize that satisfaction with the results of a bibliographic search would be ranked in the order suggested in Figure 1.

		Amount Learned	
		High	Low
Importance	High	1	2
	Low	3	4

Figure 1. Hypothesized rank ordering of satisfaction scores in relation to the amount and importance of information obtained.

If one were to emphasize the cognitive contribution of information instead of its contribution to decision making, the same two variables, amount learned and its importance, would appear relevant, though the second is less so since no "decision point" can be said to exist. In this case, the ranking of the satisfaction scores for the two middle categories would be reversed, since the amount learned would be more dominant than the importance of the material per se.

In a sense, then, though the rationale for this study is based on the economics of information, an alternative perspective is also being tested.

Methodology

The core of this study are field experiments in which different types of interview techniques were used by two search analysts, with the (inferred) effects of the search results on the users being assessed by measures of both the amount users learned and their satisfaction. In supplementary analyses, the effects of non-experimental independent variables, such as a user's prior knowledge and the importance of information sought, are assessed. As well, the latter variables are used as control variables in a path analysis that provides an integrated explanation of user satisfaction within the framework of the economics of information.

The first of the two interview techniques used in the experiment involved the use of either "open" or "closed" questions by the interviewer. The second involved the use of either "no" or "moderate" pauses. Both of these techniques alter the normal interaction that takes place by the interviewer (the search analyst) and the interviewee (the user).

The design of the first, experimental phase of the study can be best expressed as being composed of two, two-way analyses of variance with post-tests only. The experimental variables were question type and length of pause. Each had three levels--control, open, and closed questions, and control, no pause and moderate pause. Separate experiments were conducted because of the difficulty of training people to do two things at once; i.e., varying the type of questions asked and length of pauses. The same control group served for both experiments, however.

The second independent variable was "analyst"; i.e., the first or second search analyst. This variable was not introduced in order to discover which analyst was superior, but to control for the different skills of the analyst and other "nuisance" variables correlated with analyst, such as the type of user served, indiosyncracies of search technique, and so on.

The dependent variables consisted of the amount learned (a variable that, in the overall framework of the study, is considered an intervening variable) and several satisfaction variables--satisfaction with the length of the bibliography, the value of the bibliography, the value of the materials located via the bibliography, the currency of the search results, and the utility of the search results for the intended purpose.

Neither the users nor the analysts were selected at random. The former were screened only to ensure that they had not been included in the study before and were conducting retrospective searches. The latter were two analysts known to the researchers who were willing to participate. Both were employed in libraries in faculties of education in Canadian universities. One of the faculties involved a large number of masters and doctoral students, while the other served a small number of graduate students at the masters level and a large number of teachers-in-training. The first analyst was female and was new to her position. The second was male and had several year's experience at online searching.

The search analysts each conducted a total of 75 interviews--15 control interviews, 15 with open questions, 15 with closed questions, 15 with no pause, and 15 with moderate pauses. The control or "naive" interviews were conducted first, before the search analysts were trained in interview techniques (Appendix A). Subsequently, they interviewed users administering the four techniques in random order. To tell them which type of technique to administer for each search, a list numbered 16 to 75 was prepared (the first 15 interviews being the "control" group); opposite each number was an indication as to whether the search was to use open questions, closed questions, no pauses or moderate pauses. The latter four options were arranged randomly by use of a random number table. Digits 1, 2, 3, and 4 were assigned to the four options and the order of the four techniques was determined by the order of these digits in the table. Other digits were ignored, and each technique was listed only 15 times (Appendices B and C).

At the time of the interview, a tape recording was made and the search analyst completed "Search Analyst's Record of Online Search" (Appendix D). At that time or later, depending on the situation, a complete search strategy was developed, recorded, and used in completing the search. A hard copy record of the actual search was also retained.

Two to four weeks after a search had been completed, the user was telephoned and an evaluation interview was conducted, the results of which were recorded on a form "User Response to Online Search Request". In cases where the user could not be contacted by phone, a copy of the form was mailed with a stamped return envelope enclosed (Appendix E).

Subsequent to the collection of data, recordings of interviews were played in order to determine if the treatment had been administered; that is, if the search analysts had indeed used different interview techniques. The proportion of open and closed questions actually asked were recorded, as were the lengths of pauses (Appendix F).

Records of search strategies were also examined and a number of characteristics related to the complexity of the strategy were recorded.

Finally, all data were keyed into a data file for computer analysis using the Statistical Package for the Social Sciences (SPSS). The initial analysis used two-way ANOVA, as planned.

The second research question was also answered using a two-way analysis of variance, as is suggested by Figure 1. In particular, the users' responses to questions as to the importance and amount of information gained were dichotomized into high and low, and two-way ANOVA was carried out to assess the variables' effects on satisfaction and to determine the rank ordering of the cell means.

Finally, a path model was developed that integrated both the experimental variables (question type and pause) and those related to the economics of information framework (see Figure 3). Two path analyses were necessary since the data set for the "question" experiment was separate from that for the "pause" experiment. The control group was dropped for this analysis so that question and pause would be dichotomous variables appropriate to path analysis. In addition, a variable measuring prior knowledge was added as a control variable. In theory, it should have been used in the preceding analysis, but could not be due to limitations in the cell sizes. Hence, this path analysis may be the best overall test of the framework suggested by the economics of information.

Measurement of Variables

The six variables used in the various of analyses are listed in Table 1. The first, third, and fourth (ANALYST, PREKNOWL, IMPORT) are independent variables; variables 2A and 2B (QUEST and PAUSE) are the experimental variables; variable 5 (NEWKNOWL) is an intervening variable used as both an independent and dependent variable and variable 6 (SATISFAC) is used as the primary dependent variable.

Each of variables three through six is measured by two or more items (Appendix G).

PREKNOWL, a measure of the extent of a user's prior knowledge about the search topic, has six items and ranges from a minimum of 6 to a maximum of 15. The mean response for the 117 respondents was 12.2 with a standard deviation of 2.05. The Hoyt estimate of reliability for the scale is 0.67.

IMPORT, a measure of the importance of the information sought in a search, has eight items. The minimum score is 6 and the maximum is 30. The mean for the 103 respondents for whom data were available was 11.9 with a standard deviation of 3.97. The Hoyt estimate of reliability is 0.69.

Since this is a key variable, assessing how close the respondent is to his or her break-even point in making a decision, it is important to note the content of the items. Six items ask how missing relevant citations would have affected the purpose for which the search was placed, and the user's financial status. Two items seek information on the total number of people that missed information might affect. We believe this scale to be a reasonably valid measure of nearness to the decision point. If missing 50% of the available information was of no consequence, then either the decision or project could not be very much in question. At the same time, these questions, by considering the financial and social impact of the information sought, probably tap a somewhat broader definition of the importance of information than is required.

NEWKNOWL, with just two items, is a measure of the amount an individual learned about his or her topic as the result of a search. In part, this learning is projected rather than completed, since the second item concerns the amount of material the user planned to read. The scales' minimum and maximum are 1 and 9, respectively; the 112 respondent's average score was 5.13 with a standard deviation of 2.06. The Hoyt estimate of reliability is .65. This scale was reduced to the best two items from the five originally asked users.

Satisfaction has five items which are treated separately as well as totalled as SATISFAC,the overall satisfaction score. The minimum possible score is 5 and the maximum 25. The 101 respondents had an average of 18.3 with a standard deviation of 3.83. The mean translates into an average of 3.6 on a 5-point scale with 1= very low and 5=very high. The Hoyt estimate of reliability for the scale is 0.86.

Findings

This section is divided into five parts. The first provides an overview of the characteristics of the users of the two bibliographic search services and of their searches; i.e., their length, cost, etc. The second section includes evidence that treatments were given and that the four assumptions required to answer the first research question are valid. In the third section, the first research question is answered and in the fourth, the second question. In the final section, the path analyses that integrate the two questions are presented.

Characteristics of Users

Summary statistics for the users served by the two search analysts are given in Table 2. Both served users drawn from a university community, and both served about equal numbers of men and women. The users of the first search analyst, however, tended to be older than those of the second and were more likely to hold a masters or doctoral degree or be enrolled in a doctoral program.

The purposes users reported for conducting searches were rather similar. Assignments were the most common reason (Table 3). The purposes reported by the users of the second analyst were somewhat more varied than were those reported by users of the first analyst.

In both cases, essentially all users made contact in person. It is probable that both services had substantial numbers of users who phoned in or wrote. The requirement that the search interview be recorded effectively eliminated such users from the study.

Most users supplied the search analyst with synonyms for use in the search strategy. Only the second analyst reported substantial numbers who assisted with the logic.

While the total time spent doing a single search, about 42 minutes, was the same for both analysts, this time was spent differently. The first analyst conducted an extensive interview, then developed a strategy, and ran the search. The second began with a short interview, then developed the strategy and went online while interacting with the user While the connect time averaged slightly longer for the second analyst, it should be noted that this analyst often printed some citations online while the first analyst rarely did so.

The two most commonly used search systems were those offered by Lockheed Information Service and by BRS. SDC and QL (Quick Law) were never used.

The two analysts tended to search rather different data bases. ERIC was used in over 90% of all searches by the first analyst, but in only 37% of all searches by the second. The latter tended to favour Psychological Abstracts, the Social Science Citation Index (SSCI) and Dissertation Abstracts.

The lengths of the bibliographies produced by the two search analysts were quite similar. However, virtually all of the first analyst's bibliographic citations were printed offline and mailed to the user, whereas a third of the second analyst's citations were printed online and given to the user at the time of the search. The second analyst also used the online citations to verify with the user that the search was on target.

Prices averaged much higher for the second search analyst's users than for the first's. A majority of the latter received free searches.

A major difference in style is evident in the two analysts' involvement with the user, during a search. As suggested above, the first analyst rarely had users present when doing a search, and hence rarely interacted with them. The second analyst almost always did the search while they were present, and usually interacted with them.

Overall, then, it appears that two rather different settings were used for this study. At the first, the users tended to be older and more experienced, while the search analyst was new and used rather restricted methods of operation. Rarely were users present when the search strategy was worked out and the search conducted. At the second location, the clientele tended to be younger, but the analyst was more experienced and showed considerable variation in the choice of systems and data bases. Finally, users at the first location rarely paid for their searches, while those at the second location usually did so.

Treatments and Assumptions

The two search analysts were taught the basics of interview in a one day training session (Appendix A) which emphasized the asking of open and closed questions, and the use of pauses. The analysts were to use one of the techniques in each of the interviews conducted as part of the study.

One ought not assume, however, that saying and doing are one and the same. Hence, it was deemed necessary to verify that the various techniques were actually used when they were supposed to be. In addition, it was clear that verification, to the extent possible, of the assumptions made in linking interview techniques to user satisfaction was desirable.

Table 4 presents data verifying that the experimental treatments were, in fact, administered. In the first part of the table, the proportion of all questions asked by the search analysts that were open is treated as the dependent variable, while the three levels of the experimental variable (control, open and closed) are treated as the independent variable. The data clearly show that, on average, twice as many open questions were asked in the "open" interviews as in the "closed" interviews. The use of open questions in the "control" interviews was more common than in the closed interviews, but less common than in the open interviews. The relatively low frequency of open questions in all interviews suggests that it is difficult to frame such questions while engaged in negotiating a search.

Pauses of different lengths were also administered, though the average pauses, which were to be of 10 seconds in the moderate pause category, in fact only averaged a bit over two seconds. Pauses in the "no pause" category of search interviews averaged 0.6 seconds. Pauses during control searches were essentially non-existent--conversation was continuous. Measurements were not made for the pauses in these interviews, however.

It is doubtful that the treatment administered during interviews in which pauses were to be used conformed to that planned. Both conversations with the analysts and close monitoring of the tapes revealed the analysts found silences very awkward. Often, they would turn to writing or looking in a thesaurus to avoid tension while trying to prolong pauses.

The process used to map out interviews in order to measure the proportion of open questions and lengths of pauses is rather complex and is treated in detail elsewhere (Auster, Lawton and Currie, 1982). (See Part III of this report.)

Four assumptions concerning the search process were stated earlier; ideally, each should be validated.

To verify the first (that a user's responses to the search analyst's questions are related to the types of questions asked) 25 open and 25 closed questions were randomly selected from 50 tapes which were themselves selected at random. For each of these 100 questions (50 per analyst), the number of words in the response given, the number of seconds in the response, and the number of major concepts in the response were recorded. If responses having more words and concepts, and being of longer duration, followed open as opposed to closed questions, then the assumption would be validated for type of question asked.

A similar approach was taken to validate the effects of pauses. For this the ten most extreme pauses for each analyst were selected; that is, the five longest and five shortest pauses were chosen for each analyst, the long pauses from "pause" interviews and the short pauses from "no pause" interviews. The average length of the five shortest pauses was 0.0 seconds (i.e., no pause) and the average length of the five longest pauses was 23.0 seconds. After the identification of each pause (or "turnover" in conversation when there was no pause), the number of words, seconds and concepts in the response that followed were recorded.

Table 5 reports the data required to validate the fact that questions and pauses matter. In the case of open and closed questions, the relationship to the characteristics of responses is as expected:

responses to open questions tended to have more words and concepts, and take longer to complete, than did those to closed questions. It ought be noted, however, that there was considerable variation from question to question, as revealed by the large standard deviations.

The responses after pauses, however, were not longer, in words, seconds or concepts, than on occasions when there was no pause. Indeed, just the opposite is true. It may be that the excessive length of the pauses included in this sample interrupted the flow of conversation, created tension, and muted responses. Perhaps further investigation into the effects of moderate pauses (1-10 seconds) would have confirmed our expectations. However, the findings in Table 5 are consistent with results reported later, suggesting that the long pauses that occurred during these interviews were more important to the effectiveness of interviews than any moderate pauses that may have occurred. Also, the extremely large standard deviations in the numbers of words and seconds in responses to situations in which no pause occurred suggests that generalizations are risky.

To verify tne second assumption--that the search strategy developed by the analyst would be closely related to the responses given by the user --ten case studies were carried out in which the vocabulary used by the user and the discrete terms and concepts employed by the analyst were compared. In practice, five interview tapes were selected for each analyst and all key terms and concepts employed by the user in his or her description of the topic being searched were recorded. The two lists were then compared.

In all cases studied, there was an extremely close correspondence between the vocabularies employed by the users in the interview and by the search analysts in the strategies they prepared. For example, one user indicated an interest in research on the administrative role of secondary school principals. The user wanted studies of actual activities rather than opinions as to what principals should do. The search analyst developed three main conceptual groups: administration (principal, assistant principal, school administration, school personnel, chief administrators, high school supervisors); research (research, use studies, case studies, surveys, measurement, questionnaires, research tools, interviews); and secondary education (secondary grades, secondary schools, senior high schools, high schools, junior high schools).

In general, the search analysts used more terms than did the user though this phenomenon was more apparent with the first analyst then the second.

It would be wrong to assume, however, that the interview process described here is considered simply a matter of "twenty-one questions". Often, the client had only a vague idea of the information he or she desired, and the interview became very much a negotiation process in which the content and bounds of the bibliography were decided (see Auster and Lawton, 1979).

Sometimes, it appears that the negotiated settlement did not prove satisfactory to the user. For example, one user interested in the career expectancies of minority group members was dissatisfied with a search whose key terms included "ethnic group" "career aspirations" "career planning," and "career interests." In the evaluation interview, the user indicated that she had found the material she wanted by conducting a manual search. The "actual" topic dealt with the percentage of minorities actually represented in various occupations. "Expectancy" reflected not a psychological construct, but a statistical average; this distinction had not emerged during the search interview. Perhaps the user, in her own mind, had not yet made the distinction.

A second approach to validating this assumption is to relate the length of the entire interview and search process to the complexity of the search strategy, in the belief that more complex search strategies would result from searches that required more interview, strategy and connect-time.

Complexity of search strategy was measured by a five-part index consisting of the sum of the following items: (1) the number of key terms used in the search strategy, (2) the number of operations (e.g., "and," "or" and "not" employed to join terms together into concepts and to restrict major concepts to specific areas), (3) the total number of major concepts in the strategy, (4) the total number of steps in the online search strategy, and (5) the total number of data bases finally searched. The total length of the search process was measured by summing the interview time, strategy time, and connect time.

The correlation between the length of the search process and complexity of search strategy was 0.43 ($p < .001$), indicating that there was a reasonably strong link between the two.

Assumption three stated that the citations retrieved would be closely related to the content of the particular search strategy used. As a rule, one might expect more complex search strategies to produce bibliographies with a higher number and percentage of hits than would less complex ones. Since we could not control for subject matter searched, and since only one strategy was used to conduct the search for any given request, we concluded that it was impossible to satisfactorily validate this item within the design of the study. To do so would require using several different strategies to search the same topic, followed by the determination of the number and percentage of hits for each strategy.

To fully validate the final assumption, that the amount of information gained is related to the content of the citations received, would require development of a series of subject matter tests on different topics to be administered before and after searches. This was not practicable in a field setting. However, indirect validation of this assumption was provided in an earlier study (Lawton, Auster and To, 1979) wherein the correlation between the amount a user learned about his or her topic was found to have a 0.67 correlation with the user's satisfaction with the value of the bibliography and materials.

Interview Techniques

Results of the experiments to answer the first research question concerning the effects of types of questions and lengths of pauses on the amount a user learns as a result of a search and his or her overall satisfaction are presented in tables 6 and 7. Two-way analysis of variance was used, with ANALYST as a control variable. (A control variable -- as distinct from the control group -- is one which holds some variable constant so that the effects of other variables can be seen.) By controlling for analyst, one also controls for other variables correlated with analyst; in this case, variables such as the sex, experience and style of the search analysts, the different ages of their users and so forth. It is apparent from the tables that the users of one analyst, Analyst B, reported learning more and being more satisfied than those of the other analyst. It is not our purpose to explain this fact and we would note that the differences may reflect as much differences in the users as in the analysts.

Table 6 indicates that the asking of open and closed questions did not have a direct effect on the amount learned by users. As well, there was no significant interaction between analyst and question type; that is, asking open questions did not "work" better for one analyst while asking closed questions "worked" better for the other.

Table 6 also indicates that the type of pause (moderate or no pause) did have a significant effect on the amount users learned, though not in the direction hypothesized. In particular, the interviews during which analysts tried to extend pauses to ten seconds produced users who learned significantly less than did interviews during which no pauses were used or when there was no attempt to change the natural style of interviewing.

Table 7 reports the effects of the type of question and pause on overall satisfaction. None of the differences, even between analysts, are statistically significant at the .05 level, the usual criterion used. We would note, though, that the p-values are relatively low for the main effects (i.e., for question and pause but not the interaction effects). Average satisfaction was higher when open questions were asked than in the control interviews or when closed questions were asked. As well, overall satisfaction was lower when moderate pauses were used than when no pauses were allowed or when a natural interview style was used.

One feature also evident in tables 6 and 7 are the small sample sizes in each cell, numbering as small as 5 and with a maximum of 14. All were supposed to be 15 (and if they had been we suspect all of the effects noted above would be statistically significant). Unfortunately, though all 150 searches planned were conducted, it was not possible to obtain evaluation results from all users. Further, some who did return evaluation questionnaires or who were interviewed on the topic by phone, did not answer all items included in the satisfaction scale.

Further analysis, reported later, helps to confirm, though, that the trends described above are, in fact, real.

Importance of Information

The key elements of the second research question concern relationships among the importance of information to a user (i.e., its value or worth), the amount of new knowledge that an individual gained as a result of conducting an online search, and his or her satisfaction with the information received as a result. Using a framework from the economics of information and decision theory, a rank ordering of satisfaction for different levels of importance and of information gain was hypothesized (figure 1).

Table 8 presents the average satisfaction scores for the four cells suggested by figure 1, and figure 2 presents the rank ordering of the cell means as actually observed.

		Amount Learned	
		High	Low
Importance	High	2	4
	Low	1	3

Figure 2. Actual rank ordering of satisfaction scores in relation to the amount and importance of information obtained.

The ordering is certainly not as hypothesized and, at first glance, appears to be unrelated to the original propositions. However, this is not the case. What was incorrect, apparently, was our expectation that importance would be the dominant independent variable. In fact, the amount learned dominates. Thus, those learning the most about their topic were, overall, more satisfied than those who learned less. And, within these categories, those placing high importance on the information obtained tended to be associated with lower satisfaction scores rather than higher satisfaction scores, and vice versa. Stated simply, those to whom information is very important are harder to please.

Path Analysis

A more sensitive test of the relationships treated in the previous two sections is possible using path analysis, a technique that allows the introduction of more independent and control variables without the loss of precision that would accompany comparable analysis using analysis of variance.

Figure 3 presents the path diagram used to assess the effect of all of the variables associated with the economics of information framework and the effect of the question experiment. Because the question and pause experiments were conducted separately, two separate path analyses must be conducted. In doing so, one replicates many of the relationships apparent in figure 3.

In the path analyses, the control level of the experimental variables has to be dropped so that the question and pause variables become dichotomies. In the case of QUEST, closed questions were coded as 0 and open questions as 1. Hence, positive path coefficients imply a relationship in which there is a positive effect of open questions on the dependent variables. For PAUSE, "no pause" is coded 0 and "moderate pause" as 1.

In addition to considering the effects of all the independent and intervening variables on overall satisfaction (SATISFAC), analyses have also been conducted to determine their effects on individual items in the satisfaction scale.

Table 9 presents the correlation matrix, means and standard deviations for all of the variables included in the first path analysis pictured in figure 3. The mean of 0.50 for ANALYST implies that 50% of the searches were conducted by each analyst; the mean of 0.556 for QUEST implies 55.6% of the interviews were part of the open question experimental group. Scale means for the other items are explained further in Appendix G. The sample size is 36, indicating that 24 subjects were lost due to non-responses or the inability of researchers to contact the users. The number is smaller than that reported even for the two experimental groups earlier because a larger number of scales are included in this analysis. Each time a user skipped a key question, the sample size drops by one. As well, a singleitem to measure knowledge gain was used in the earlier analysis whereas a two item scale is used here.

Four zero-order correlations are statistically significant -- those between ANALYST and PREKNOWL, between QUEST and NEWKNOWL, between QUEST and SATISFAC, and between NEWKNOWL and SATISFAC. The first correlation (-0.27) indicates that the users of search analyst B (coded 1) reported that they were less knowledgeable about their topics at the start of their searches than did those of search analyst A (coded 0). This conclusion is consistent with the differences in the two analyst's users, as noted earlier.

The second pair of correlations (0.35 and 0.28) indicate that open questions were positively associated with both the user's gain in knowledge and overall satisfaction. The former of these is rather inconsistent with the finding reported earlier in table 6. The differences in the number and identity of the subjects included in the sample must account for this anomally. The other correlation is consistent with the trend noted earlier.

The final correlation of 0.39 confirms the positive relationship between the amount a person learned and his or her overall satisfaction, a relationship identified in our earlier research.

These are, of course, zero-order correlations; that is, the effects of other variables have not been controlled. However, the path coefficients reported in figure 3 do reflect the strengths of relationships with the effects of all variables to the left of a given variable being controlled. Thus, the .39 coefficient for the path from QUEST to NEWKNOWL indicates that question type had a moderately strong effect on the amount a person learned, controlling for prior knowledge (PREKNOWL), ANALYST, and IMPORT (importance of information). The only other significant effect was that of NEWKNOWL on SATISFAC. Though not significant, the coefficients of .24 and .22 connecting ANALYST and QUEST to SATISFAC suggest residual effects of these two variables on satisfaction independent of their effect through

NEWKNOWL. Also note the unanalyzed correlations between ANALYST and PREKNOWL (noted earlier), between PREKNOWL and IMPORT, between QUEST and IMPORT, and the slight negative effect of IMPORT on SATISFAC. While these are not statistically significant, they were found consistently throughout the analyses, suggesting they may be real. The correlation between QUEST and IMPORT is by chance (since the question type was randomly assigned) but suggests that clients in the open question experimental group happened to have a greater need for information than did those in the closed question group. Also, the -0.11 path coefficient between IMPORT and SATISFAC suggests that those with a greater need for information were harder to please, a relationship also noted earlier.

The "e" or error variables in figure 3 represent hypothetical variables that would explain variation not explained in the current path model.

In short, then, this analysis gives strong support for aspects of both the research questions. Open questions were more effective in facilitating searches that helped users learn more and gave them greater satisfaction, once relevant variables are controlled. Also, users for whom uncertainty was reduced (i.e., who learned more), were more satisfied. The importance or value of the information did not have a statistically significant effect, but indications are that its effect may be the opposite of that anticipated.

The path coefficients for the model in figure 3 are repeated in table 11. In addition coefficients are given for similar path models with the five items that compose the satisfaction index serving separately as dependent variables. Note that the first six coefficients are in fact zero-order correlation coefficients. In theory, they ought all be the same for all analyses, but in fact vary slightly because the samples change slightly from one analysis to the other.

There are several consistent effects apparent in the item analyses that were not apparent in the path analyses of overall satisfaction. First, the analyst's direct effect on satisfaction is apparent only in regards to the value of the bibliography (VALUEB) and its currency (CURRENT). Second, the direct effect of question type on satisfaction is apparent for the value of the bibliography, materials and utility, and not length or currency. Third, the effect of knowledge gain on satisfaction is apparent primarily for the value of materials (VALUEM) and the utility of the search results. Fourth, the level of prior knowledge (PREKNOWL) has a negative effect on currency, and importance (IMPORT) has a negative effect on length and utility.

Taken together these relationships suggest that the links among question type, knowledge gain, and satisfaction with the bibliography, materials, and utility of results form the fundamental structure explaining satisfaction. The identity of the analyst, prior knowledge of the topic and the importance of the information tend to affect satisfaction with less critical areas such as the length and currency of the bibliography.

The correlation matrix for the overall analysis involving the pause experiment is given in table 12. In general, the pattern of significant correlations is similar to that for the question experiment. However, the correlation between PAUSE and NEWKNOWL is not significant while that for QUEST and NEWKNOWL was, and the correlation between NEWKNOWL and PREKNOWL is significant where as it was not before. Correlations between satisfaction and PAUSE and NEWKNOWL show significant results whereas earlier analyses had suggested only trends.

The mean of 0.61 for ANALYST indicates the second search analyst conducted 61% of the search on which this analysis is based. The mean of 0.39 for PAUSE means 39% were moderate pause interviews and 61% were no pause interviews.

Table 12 reports the full set of path coefficients. Among the correlations, only the high negative correlations between ANALYST and PREKNOWL stand out, again emphasizing that the second analyst served primarily undergraduate and master of education students, while the first search analyst served many doctoral students. Path analysis does control for this difference in the two settings (as did controlling for analyst in the earlier analyses).

Among the path coefficients, a consistent positive effect of prior knowledge on new knowledge is observed. PAUSE (i.e., moderate pauses) has negative effects on overall satisfaction and all satisfaction items except currency. PREKNOWL tends to have a negative effect on satisfaction (a relationship not suggested in the preceding analysis). IMPORT has a weak (not statistically significant) negative effect on satisfaction--similar to that noted previously. Finally, NEWKNOWL, the gain in knowledge about the topic, has a strong positive effect on all aspects of satisfaction except currency. Again, note that analyst had a positive effect on currency (meaning the second analyst must have provided more up-to-date searches in the eyes of the users).

Discussion

In this study, we set out to explain a relationship we had identified in earlier work -- that between the amount a search service user learns about his or her topic as a result of a search and the user's overall satisfaction. Two experiments were conducted, one in which the interviewer asked open or closed questions, and one in which the interviewer interjected pauses of moderate length or did not pause during the search interview. Finally, an explanation for user satisfaction was proposed that depended on inferences derived from the economics of information. The findings only partially verified the expectations set forth before the study was conducted.

On the positive side, the experiment involving the use of open and closed questions provided strong evidence that interviews in which more open questions were asked resulted in searches in which users probably learned more and certainly were more satisfied. Also, it proved that search analysts can be successfully trained to change their interview styles -- even in a brief, one-day workshop -- and that this training can result in a better bibliographic search service.

The study also gives some support to a calculus of satisfaction in which prior knowledge, knowledge gain, and the importance of the information play a role. Certainly, the amount learned -- which we take as a measure of the reduction in uncertainty -- is strongly related to satisfaction. The importance of information -- which we take as a measure of proximity of the searcher to the decision point -- appeared not so important and, in fact, was negatively related to satisfaction. This finding suggests those near the point of decision are harder to satisfy than are those who have essentially already decided. This makes sense, though it was not what we had anticipated.

Perhaps the greatest surprise was the strong negative effect that pauses had on the quality of searches. Recall that our intent was to slow down the interview process, to give the users time to express ideas. Too often, it seemed to us, search analysts dominated, directed and decided, sometimes cutting off users in order to assert their own understanding of the users' topics.

In translation to action, something may have been lost. Perhaps mandating 10 second pauses versus no pauses was too extreme. As well, there was the problem, for both the interviewers and us, of knowing when a pause occurs. Is it after a search analyst speaks? After the client speaks but before the analyst speaks? A break in the talk of either participant? We found operationalizing the concept difficult. Our decision, described earlier, seemed the best choice, but may have missed something vital. Certainly, as the validation of the treatment and assumptions make clear, the analysts did pause longer when they were supposed to; sometimes, it appears, they paused too long.

It would seem , then, that pauses do make a difference. Longer pauses, especially if the analyst is not paying attention to the user, have negative effects. This is not what we had intended to demonstrate, but nevertheless is a finding that has been clearly demonstrated. As well, it is apparent that it is harder to train analysts to use pauses effectively than it is to train them to use open and closed questions effectively.

Finally, the dominance of the "amount learned", and the weakness of the "importance of information" in determining satisfaction suggests, for the users studied, that the decision-making model concentrating on the reduction in uncertainty is not fully appropriate. Indeed, it may have been inappropriate.

It was suggested earlier that a reversal of the hypothesized roles of knowledge gain and the importance of information in explaining satisfaction would corroborate of a model of satisfaction based on cognitive psychology rather than the decision-making model proposed. Perhaps, then, the importance of the amount learned implies that the contribution of the search and its products to the ideas, understanding, and thinking of the user is of utmost importance, and not its immediate utility for decision-making in an economic context. This interpretation would be consistent with the fact that most searches conducted by the users of the analysts in this study were for the purposes of assignments. That is, the users were students who were learning, not consumers or administrators making decisions.

Limitations

It has been said that more is known about white rats and first year psychology students than any other two creatures on earth. Perhaps university library clientele should be added to this list.

The major limitation of the current study is the restricted nature of the clientele served by the two search analysts. Virtually all users were university students in education faculties who walked in to their respective libraries and requested searches on single topics, usually related to an assignment that they were doing.

We suspect that the basic effects of the experiments and of the amount learned on the users' levels of satisfaction would be observed for populations other than education students. However, the relative roles of "prior knowledge" and the "importance of the information" might be very different for other populations seeking information for other reasons.

That there were only two search analysts and, in the end, very small sample sizes might also be considered limitations. Yet, the major effects were strong enough to be seen in spite of the different styles or approaches of the search analysts and the small sample sizes. If the effects are strong enough to be evident in such a hostile field setting, we believe that they would be evident in a larger scale study that would overcome these limitations.

Finally, we note that there were "constants" in many places where there could have been variables, and that many nuisance variables were not controlled but assumed to be randomly distributed. For example, method of contact (walk-in), type of search (retrospective) and type of library (education) were all constants. System used, topic, data base, approach to searching (e.g., whether or not the user was present during the search) were all assumed to vary randomly, though they could have been introduced as independent variables, given a sufficiently large sample size.

Implications and Conclusions

The findings of this study are quite promising as far as the practice of online bibliographic searching is concerned. The search interview has been confirmed as a maleable factor that affects the quality of the search, as perceived by the user. Not only can one conclude that search analysts would do well to develop a facility to ask open questions, but that other factors that have been identified in the literature on interview techniques may prove useful as well.

The negative effects of moderate pauses in one of the experiments indicates that caution is necessary, however. Identification of factors that can be manipulated to affect satisfaction carries with it the implication that negative as well as positive effects may occur. Cautious experimentation and continuing evaluation is necessary to find the right combination.

As far as the pause experiment is concerned, one should not conclude that any attempt to slow the pace of questioning will reduce satisfaction, as was the case here. One would, however, be advised to use shorter pauses. Were we to repeat this study, we might be more likely to advise the search analysts simply to "count to 3" after a break in conversation to ensure the user has nothing more to say.

The evidence concerning the utility of the framework drawn from the economics of information to explain user satisfaction is more ambiguous. The reassessment of the relative influence of two key variables -- the importance of information and the amount learned -- in light of the findings may be appropriate. That is, if the reduction in uncertainty, as measured by the amount learned, has a more powerful influence on the satisfaction of users than does the nearness of the user to his or her decision-point, as measured by the importance of the information, then the findings make sense. Even then, many of the relationships are weak and somewhat unexptected; e.g., the fact that those with greater prior knowledge or for whom information is more important express lower satisfaction, implying that they are harder rather than easier to satisfy than others, even when the information they obtain is relevant to their needs.

Alternatively, these findings may indicate the proposed framework is inadequate, and that a better explanation, at least for the user of the services studied here, is to be found elsewhere. One approach that has been suggested draws on cognitive psychology and emphasizes the "maps" that people develop in their minds in order to account for the world they observe (Woodward, 1980). Such an alternative explanation would be consistent with the findings, in which the amount of knowledge gained is a powerful intervening variable. It would also suggest, perhaps, new approaches to the strategies employed by interviewers in attempting to draw out the maps in their users' minds, and translate them into the artificial world of ANDs, ORs, and AND NOTs used by search analysts.

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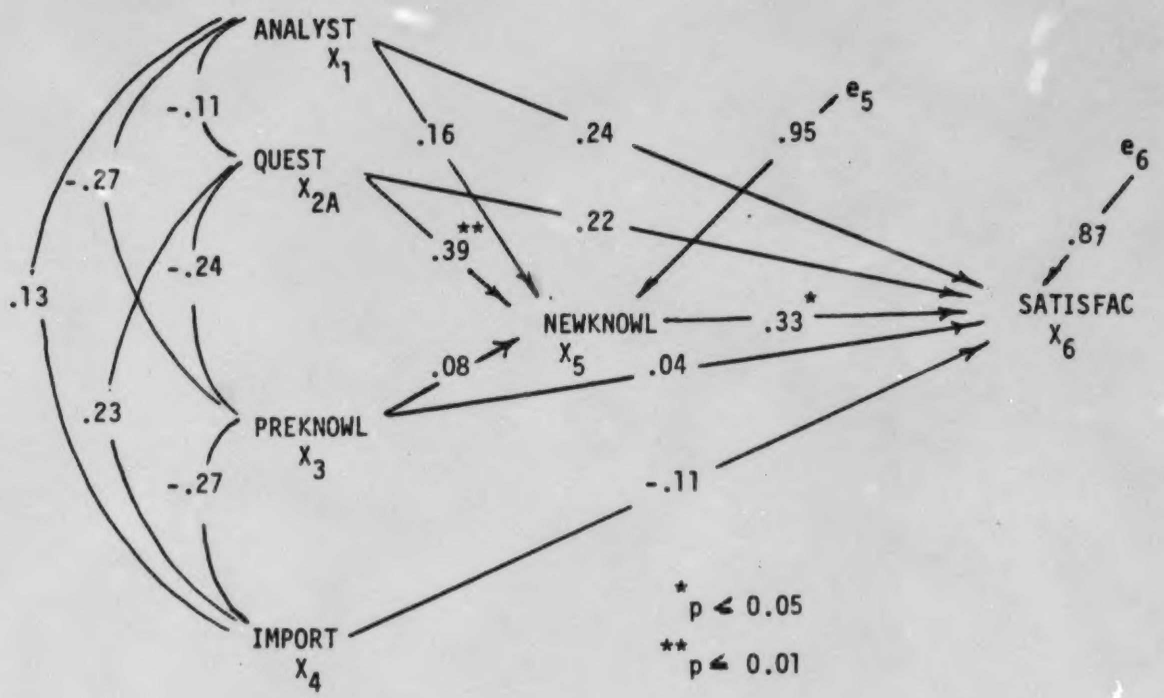
ANALYST
X_1
QUEST
X_{2A}
PREKNOWL
X_3
IMPORT
X_4
NEWKNOWL
X_5
SATISFAC
X_6
e_5
e_6
-.11
-.27
.13
-.24
.23
-.27
.16
.24
.95
.87
.39**
.22
.33*
.08
.04
-.11
*p ≤ 0.05
**p ≤ 0.01

Figure 3. Path analysis model for explaining user satisfaction.

Table 1 Variables Used to Explain User Satisfaction

No.	Variable Name	Variable Description and Coding	
1.	ANALYST	Search analyst Search analyst	A - 0 B - 1
2A.	QUEST	Closed Question Open Question Control (not used in path analysis)	- 0 - 1 - 3
2B.	PAUSE	No pause Moderate pause Control (not used in path analysis)	- 0 - 1 - 3
3.	PREKNOWL[a]	Extent of knowledge about topic before search	
4.	IMPORT[a]	Importance of information being sought	
5.	NEWKNOWL[a]	Increase in knowledge about topic due to search	
6.	SATISFAC[a]	Satisfaction with search	

[a] See Appendix G for complete list of scale items used.

Table 2 Characteristics of Users of Search Services by Analyst

Characteristic	Analyst A	Analyst B	Total/Overall
User's organization			
School system	1.4%	1.4%	1.4%
Community college	2.6	1.4	2.0
Faculty of ed.	0.0	5.7	2.7
Ministry of ed.	0.0	1.4	0.7
University	96.1	90.0	93.0
User's sex			
Male	45.5%	48.6%	47.0%
Female	54.5	51.4	53.0
User's age			
25 or under	12.9%	46.6%	29.2%
26 - 35	43.5	36.2	40.0
36 - 45	30.6	10.3	20.8
over 45	12.9	6.8	9.9
User's highest degree			
None	3.2%	29.3%	15.8%
Bachelors	22.6	43.1	32.5
Masters	56.5	17.2	37.5
Doctorate	16.1	10.3	13.3
Other	1.6	0.0	0.8
User's role			
Administration	3.2%	3.4%	3.3%
Teaching	11.1	8.6	9.9
Research	9.5	10.3	9.9
Undergraduate	1.6	25.9	13.2
Masters	25.4	32.6	29.0
Doctoral	46.0	8.6	28.1
Other	3.2	10.3	6.8

Table 3 Characteristics of Searchers Conducted by Analyst

Characteristic	Analyst		
	A (n = 77)[a]	B (n = 75)	Total/Overall
Purpose			
Keep abreast	1.4%	1.4%	1.4%
Assignment	82.4	69.9	76.2
Bibliography	0.0	2.7	1.4
Curric. Dev.	2.7	0.0	1.4
Program Imp.	0.0	2.7	1.4
Speech, article	0.0	5.5	2.7
R & D	13.5	12.3	12.9
Other	0.0	5.5	2.7
Contact method			
Walk-in	100.0%	98.6%	99.3%
Letter	0.0	1.4	0.7
User supplied			
Synonyms	86.8%	83.3%	85.1%
Logic	2.6	16.7	9.5
Other references	2.6	0.0	1.4
Interview time	15.7 min.	5.4 min.	12.3 min.
Strategy time	11.2 min.	18.7 min.	13.7 min.
Connect time	14.3 min.	17.4 min.	15.8 min.
Total search time	41.2 min.	41.5 min.	41.8 min.
System used			
SDC	0.0%	0.0%	0.0%
LIS	22.4	23.2	22.8
QL	0.0	0.0	0.0
INFOGLOBE	0.0	2.9	1.4
BRS	97.4	88.4	93.1
OTHER	1.4	2.9	2.1
Data base			
ERIC	90.9%	36.5%	64.2%
PSYCHABS	20.8	35.1	27.8
SOCABS	18.2	5.4	11.9
SSCI	0.0	16.2	7.9
EXcep. Child	5.2	9.5	7.3
DISSABS	9.1	14.9	11.9
OTHER	36.4	75.1	55.6
Citations printed			
Online	0.6	30.0	14.0
Offline	86.8	62.6	75.0
Total	87.4	92.6	89.0
Price	$ 3.34	$16.08	$ 9.71
User present for search	9.2%	98.6%	52.7%
Interaction during search	7.9%	82.8%	42.1%

---

[a] Different numbers of clients responding to various items. Two extra searches not included in other analyses.

Table 4 Verification of Experimental Treatment

Question Type	Proportion of Open Questions	
	Mean	S.D.
Control	16.5	10.7
Open	23.9	17.6
Closed	12.9	7.9

$F(2,87)=5.819$ $P \leq .004$

Pause	Average Length of Pause	
	Mean	S.D.
Control	N/A	N/A
Mod. Pause	2.06	1.50
No Pause	0.68	0.74

$F(1,58)=20.620$ $P \leq .001$

Table 5 Validation of Effect of Questions and Pauses on Responses

Response Characteristics		Question		Pause	
		Open (n=48)	Closed (n=50)	No Pause (n=10)	Pause (n=10)
No. of words	$\bar{x}$	30.6	12.5	17.8	8.6
	s	25.1	18.1	37.3	8.3
No. of seconds	$\bar{x}$	15.6	6.4	8.5	4.0
	s	12.4	11.4	17.6	5.0
No. of concepts	$\bar{x}$	2.4	1.3	1.9	1.4
	s	1.4	0.8	1.8	0.7

Table 6 Summary of ANOVA Results for Assessing Affects of Question Type and Pause on New Knowledge Controlling for Analyst

Question Experiment

Cell Means and Frequencies

	Control	Open	Closed
Analyst A	7.00 (13)	6.57 (14)	7.09 (11)
Analyst B	7.64 (14)	7.91 (11)	7.31 (13)
Total	7.33 (27)	7.16 (25)	7.21 (24)

QUEST	F(2,70) = 0.05	p = .948
ANALYST	F(1,70) = 3.66	p = .060
Q x A	F(2,70) = 1.95	p = .501

Pause Experiment

Cell Means and Frequencies

	Control	Moderate	None
Analyst A	7.00 (13)	5.33 (9)	7.15 (13)
Analyst B	7.64 (14)	7.11 (9)	8.00 (11)
Total	7.33 (27)	6.22 (18)	7.54 (24)

PAUSE	F(2,63) = 3.80	p = .014
ANALYST	F(1,63) = 3.14	p = .050
P x A	F(2,63) = 1.86	p = .572

Table 7 Summary of ANOVA Results for Assessing Affects of Question Type and Pause on Overall Satisfaction Controlling for Analyst

Question Experiment

Cell Means and Frequencies

	Control	Open	Closed
Analyst A	17.8	18.8	16.6
	(12)	(13)	(10)
Analyst B	18.9	20.6	18.0
	(14)	(10)	(12)
Total	18.4	19.6	17.4
	(26)	(23)	(22)

QUEST	$F(2,65) = 2.008$	$p = 0.143$
ANALYST	$F(1,65) = 2.301$	$p = 0.134$
Q x A	$F(2,65) = 0.818$	$p = 0.949$

Pause Experiment

Cell Means and Frequencies

	Control	Moderate	None
Analyst A	17.8	16.6	17.6
	(12)	(5)	(11)
Analyst B	18.9	16.9	19.6
	(14)	(8)	(11)
Total	18.4	16.8	18.6
	(26)	(13)	(22)

PAUSE	$F(2,55) = 1.320$	$p = 0.276$
ANALYST	$F(1,55) = 1.728$	$p = 0.194$
P x A	$F(2,55) = 0.224$	$p = 0.800$

Table 8 Analysis of Variance Showing Relationship of Importance of Information and New Knowledge with Overall Satisfaction

Cell Means and Frequencies

		NEWKNOWL		
		High	Low	Mean (Total)
IMPORT[a]	High	19.1 (29)	15.7 (23)	18.3 (53)
	Low	19.8 (27)	16.8 (26)	17.6 (52)
	Mean	19.4 (56)	16.3 (49)	18.0 (105)

ANOVA Table

Source of Variation	SS	af	MS	F	p-value
IMPORT	21.03	1	21.03	1.460	0.230
NEWKNOWL	261.32	1	261.32	18.132	0.000
IMPORT x NEWKNOWL	1.48	1	1.48	0.103	0.749
Explained	277.30	3	92.44		
Residual	1455.61	101	14.41		
Total	1732.91	104	16.66		

[a] Item (a) in the IMPORT scale (Appendix G) was used to measure IMPORT.

Table 9 Correlation Matrix, Means, and Standard Deviations For Variables in Question Experiment

		X_1	X_{2A}	X_3	X_4	X_5	X_6
ANALYST	X_1						
QUEST	X_{2A}	-0.112					
PREKNOWL	X_3	-0.274[b]	0.235				
IMPORT	X_4	0.131	0.225	-0.272			
NEWKNOWL	X_5	0.095	0.354[b]	-0.048	0.217		
SATISFAC	X_6	0.232	0.281[b]	-0.125	0.002	0.393[a]	
Mean		0.500	0.556	8.81	13.97	6.44	18.00
Std. Dev.		0.507	0.504	1.95	3.66	1.78	3.63
n = 36							

[a] $p \leq 0.01$

[b] $p \leq 0.05$

Table 10 Correlation Matrix, Means, and Standard Deviations for Variables in Pause Experiment

		X_1	X_{2B}	X_3	X_4	X_5	X_6
ANALYST	X_1						
PAUSE	X_{2B}	0.088					
PREKNOWL	X_3	-0.523[a]	-0.125				
IMPORT	X_4	-0.056	-0.015	0.162			
NEWKNOWL	X_5	-0.172	-0.128	0.304[b]	0.247		
SATISFAC	X_6	0.117	-0.301[b]	-0.138	-0.173	0.405[a]	
Mean		0.613	0.387	8.81	14.42	6.90	18.00
Std. Dev.		0.495	0.495	1.97	4.75	2.02	4.02
n = 31							

[a] $p \leq 0.01$

[b] $p \leq 0.05$

Table 11 Path Coefficients for Assessing Affect of Question Type on User Satisfaction

Path	Statistic	Satisfaction Item					
		SATISFAC	LENGTH	VALUEB	VALUEM	CURRENT	UTILITY
1. ANALYST-QUEST	r_{12}	-0.11	-0.08	-0.08	-0.08	-0.11	-0.05
2. ANALYST-PREKNOWL	r_{13}	-0.27	-0.32^b	-0.32^b	-0.32^b	-0.27	-0.30
3. ANALYST-IMPORT	r_{14}	0.13	0.13	0.13	0.13	0.13	0.17
4. QUEST-PREKNOWL	r_{23}	-0.24	-0.23	-0.23	-0.23	-0.24	-0.27^b
5. QUEST-IMPORT	r_{24}	0.23	0.29^b	0.29^b	0.29^b	0.23	0.26^b
6. PREKNOWL-IMPORT	r_{34}	-0.27	-0.25	-0.25	-0.25	-0.27	-0.29^b
7. NEWKNOWL-ANALYST	p_{51}	0.16	0.12	0.12	0.12	0.16	0.13
8. NEWKNOWL-QUEST	p_{52}	0.39^a	0.38^a	0.38^a	0.38^a	0.39^a	0.35^a
NEWKNOWL-PREKNOWL	p_{53}	0.08	0.09	0.09	0.09	0.09	0.06
10. SATISFAC-ANALYST	p_{61}	0.24	0.02	0.18	0.17	0.26	0.11
11. SATISFAC-QUEST	p_{62}	0.22	0.01	0.25	0.21	0.00	0.28^b
12. SATISFAC-PREKNOWL	p_{63}	-0.04	0.01	0.14	0.03	-0.22	0.01
13. SATISFAC-IMPORT	p_{64}	-0.11	-0.17	0.00	-0.04	-0.02	-0.14
14. SATISFAC-NEWKNOWL	p_{65}	$.33^b$	0.26	0.17	0.41^a	0.20	0.41^a
	n	36	39	39	39	36	38
	$\bar{x}$	18.0	3.59	3.59	3.36	3.89	3.58
	s	3.63	0.88	0.94	0.93	0.85	1.03

[a] $p \leq 0.01$

[b] $p \leq 0.05$

Table 12 Path Coefficients for Assessing Affect of Pause Length on User Satisfaction

Path	Statistic	Variable					
		SATISFAC	LENGTH	VALUEB	VALUEM	CURRENT	UTILITY
1. ANALYST-PAUSE	r_{12}	0.09	0.04	0.04	0.04	0.09	0.04
2. ANALYST-PREKNOWL	r_{13}	-0.52^a	-0.49^a	-0.49^a	-0.49^a	-0.52^a	-0.49
3. ANALYST-IMPORT	r_{14}	-0.06	-0.03	-0.03	-0.03	-0.06	-0.03
4. PAUSE-PREKNOWL	r_{23}	-0.13	-0.14	-0.14	-0.14	-0.13	-0.14
5. PAUSE-IMPORT	r_{24}	-0.01	-0.04	-0.04	-0.04	-0.01	-0.04
6. PREKNOWL-IMPORT	r_{34}	0.16	0.17	0.17	0.17	0.16	0.17
7. NEWKNOWL-ANALYST	p_{51}	-0.01	-0.03	-0.03	-0.03	-0.02	-0.03
8. NEWKNOWL-PAUSE	p_{52}	-0.09	-0.08	-0.08	-0.08	-0.09	-0.08
9. NEWKNOWL-PREKNOWL	p_{53}	0.29	0.28	0.28	0.28	0.29	0.28
10. SATISFAC-ANALYST	p_{61}	0.09	0.16	-0.10	-0.16	0.39^b	0.10
11. SATISFAC-PAUSE	p_{62}	-0.28^b	-0.30^b	-0.24	-0.41^a	0.06	-0.21
12. SATISFAC-PREKNOWL	p_{63}	-0.24	-0.26	-0.22	-0.31^b	-0.12	-0.11
13. SATISFAC-IMPORT	p_{64}	-0.15	-0.26	-0.18	-0.18	0.22	-0.26
14. SATISFAC-NEWKNOWL	p_{65}	0.52^a	0.42^a	0.54^a	0.36^a	0.21	0.57^a
	n	31	32	32	32	31	32
	$\bar{x}$	18.0	3.50	3.50	3.59	3.74	3.69
	s	4.02	0.76	1.11	1.07	0.97	1.03

[a] $p \leq 0.01$

[b] $p \leq 0.05$

Appendix A

The Ontario Institute for Studies in Education
Department of Educational Administration

SSHRC Project: Search Interview Techniques for
Online Bibliographic Retrieval

TRAINING SESSION FOR SEARCH ANALYSTS
Held Nov. 14, 1979, 10am-4:30pm
OISE, Room N733

SCHEDULE OF ACTIVITIES

10:00 am	Introduction of Participants
10:15 am	Overview of the Project Purpose Types of searches User sample Instruments for Data Collection - Search Analyst's Record - Taped Interviews - User Questionnaire Sequence of Experimental Interview Techniques
11:15 am	The Search Analyst's Role in the Research Experimental Interview Techniques - open questions (o) - closed questions (c) - ten - second pauses (p) - no pauses (n) - control
12:00 pm	LUNCH
1:30 pm	Simulating Experimental Interview Techniques
3:00 pm	Analysis of Simulated Interviews
4:30 pm	Wrap-Up

Materials for Distribution: CLJ, JASIS articles
Sequence for experimental interviews
Search record
User questionnaire
Tape cassettes

Appendix B

Sequence of Experimental Interview Techniques
Search Analyst A

No.	Technique	No.	Technique	No.	Technique
1-15	control	35	p	55	o
16	o	36	c	56	c
17	n	37	c	57	p
18	n	38	o	58	o
19	p	39	c	59	n
20	o	40	c	60	p
21	n	41	p	61	p
22	o	42	c	62	c
23	n	43	p	63	n
24	n	44	n	64	o
25	p	45	n	65	n
26	o	46	o	66	c
27	p	47	p	67	n
28	o	48	o	68	p
29	o	49	c	69	c
30	o	50	n	70	o
31	p	51	n	71	c
32	c	52	c	72	c
33	n	53	o	73	n
34	c	54	p	74	p
				75	p

Appendix C

Sequence of Experimental Interview Techniques

Search Analyst B

No.	Technique	No.	Technique	No.	Technique
1-15	control	35	c	55	o
16	p	36	o	56	c
17	c	37	n	57	o
18	n	38	c	58	c
19	p	39	c	59	n
20	p	40	c	60	p
21	o	41	n	61	p
22	o	42	c	62	p
23	o	43	o	63	n
24	n	44	o	64	n
25	p	45	n	65	o
26	n	46	p	66	o
27	p	47	n	67	o
28	o	48	c	68	n
29	o	49	c	69	o
30	n	50	p	70	p
31	p	51	c	71	o
32	c	52	p	72	c
33	n	53	n	73	p
34	n	54	c	74	c
				75	p

Search No.: ______________
Analyst: _____A _____B
Treatment: _____o _____n
_____p _____c

Appendix D

The Ontario Institute for Studies in Education
Department of Educational Administration

Search Analyst's Record of Online Search

1. Name ______________________

2. Address ______________________
____
____
Tel. (   ) ______________________

3. Topic: ______________________
____
____

4. Date (day/mo./yr.) ___ ___ ___

5. Purpose of search:

___Keep abreast of field
___Assignment, tarm paper, thesis
___Prep., update of bibliography
___Curriculum Development
___Program improvement
___Speech, article, report
___Research/development report
___Browsing
___Personnel recruitment, evaluation
___Policy development
___Other: ______________________

6. Contact: ___Walk-in ___Letter ___Phone ___Other: ______________

7. User supplied: ___synonyms ___logic ___other refs. ___none

8. Interview time ___ min.

9. Strategy time ___ min.

10. Connect time ___ min.

11. System: ___SDC ___BRS
___Lockheed ___N.Y. Times
___OL ___Other: ____________
___InfoGlobe

12. Data base(s): ___ERIC ___SSCI ___Diss. Abs.
___Psych. Abs. ___ECER ___Other: ______________
___Soc. Abs. ___Child Abuse

13. Citations printed online ______

14. Citations printed offline ______

15. Price charged: ________

16. User present during search: ___Yes ___No
___Other: ______________________

17. Did user interaction take place during search: ___Yes ___No

18. Requestor's organization: ___School board ___Ministry of Education
___CAAT ___University
___Faculty of education ___Other: ______________

19. Sex: _____Male _____Female

Search No.: ____________

Respondent: ____SA ____User

The Ontario Institute for Studies in Education
Department of Educational Administration

User Responses to Online Search Request

The Social Sciences and Humanities Research Council of Canada has sponsored this inquiry into factors affecting user satisfaction with online retrieval services. The data collected from this user questionnaire will be used only for research purposes. Ultimately, it is hoped that the results will help to improve online services. Please read each question carefully and indicate your response with a check mark: _✓_

Personal Data

1. Age
   - ___25 or under
   - ___26-35
   - ___36-45
   - ___46-55
   - ___56-65
   - ___over 65

2. Highest earned degree
   - ___None
   - ___Bachelor's
   - ___Master's
   - ___Doctorate
   - ___Other:____________

3. Please indicate your primary professional role or function. (Check one only)
   - ___Administration or supervision
   - ___Teaching
   - ___Research
   - ___Library services
   - ___Private consultant
   - ___Undergraduate student
   - ___B.Ed. or M.Ed. student
   - ___Other master's student
   - ___Doctoral student
   - ___Other

4. How many years have you been in your current position?
   - ___Less than one year
   - ___1 year
   - ___2 years
   - ___3 years
   - ___4 to 6 years
   - ___7 to 9 years
   - ___10 or more years

Extent of Knowledge About Topic Before Search

5. Have you written any professional papers for publication on the topic of your search in the last five years?

   _____Yes _____No

6. Have you given any talks or presentations at conferences on this topic in the last five years?

   _____Yes _____No

7. Have you taken any graduate-level courses on this topic in the last five years?

   _____Yes _____No

8. Have you taught courses on this topic in the last five years?

   _____Yes _____No

Extent of Knowledge About Topic Before Search (Cont'd)

9. Have you participated in an research project on this topic in the last five years?

_____Yes _____No

10. How would you rate the amount of knowledge you had on this topic before the search?

___No knowledge
___Basic
___Moderate
___Advanced
___Expert

11. Please indicate which of the following sources you had already consulted or searched before conducting the online search.

___Human resources
___Office files, reports
___Prof. organizations
___Libraries and their holdings--journals, books, indexes
___Conferences
___Prof. development days
___Academic, prof. courses
___Curriculum guides, texts
___ERIC materials
___Other

Extent of New Knowledge About Topic After Search

12. How much did you learn about your topic as a result of the search?

___Nothing
___Very little
___Some
___Quite a bit
___Extremely large amount

	Percentage				
	0%	1-10%	10-20%	21-50%	More than 50%
13. Of the citations retrieved that were relevant to your topic, how many were familiar to you prior to this search?	___	___	___	___	___
14. Of the citations retrieved that were relevant to your topic, how many were new to you?	___	___	___	___	___
15. How many of the citations retrieved do you plan to read?	___	___	___	___	___

16. How much additional information do you still desire concerning the topic that was searched?

___Nothing
___Very little
___Some
___Quite a bit
___Extremely large amount

Value Placed on New Knowledge

	Satisfaction				
Please indicate your satisfaction with the following aspects of your search.	Very Low	Low	Moderate	High	Very High
7. Helpfulness of search analyst	___	___	___	___	___
18. Length of bibliography	___	___	___	___	___
19. Time taken to deliver bibliography	___	___	___	___	___
20. Value of the bibliography	___	___	___	___	___
21. Value of materials located via bibliography	___	___	___	___	___
22. Currency (up-to-dateness) of the search results	___	___	___	___	___
23. Utility of the search results for your intended purpose	___	___	___	___	___
24. Price of the search	___	___	___	___	___

Consequences of Missed Information

	Affect				
	Not at all	Slightly	Some what	Consider-ably	Greatly
25. If your search had missed 10% of the relevant citations available in the system, how would this affect the ultimate purpose for which you placed the search?	___	___	___	___	___
26. If your search had missed 50% of the relevant citations available in the system, how would this affect the ultimate purpose for which you placed the search?	___	___	___	___	___
27. If your search had missed 10% of the relevant citations available in the system, how would you be affected financially?	___	___	___	___	___
28. If your search had missed 50% of the relevant citations available in the system, how would you be affected financially?	___	___	___	___	___

29. If your search had missed 10% of the relevant citations, would the project or purpose for which you placed the search be undertaken or completed anyway?

_____Yes _____No

30. If your search had missed 50% of the relevant citations, would the project or purpose for which you placed the search be undertaken or completed anyway?

_____Yes _____No

31. If 50% of the documents retrieved were irrelevant, who would be most affected?

___You only
___You and your work group
___You and your entire organization
___A larger number of people
___Not applicable

32. If 90% of the documents retrieved were irrelevant, who would be most affected?

___You only
___Your and your work group
___You and your entire organization
___A larger number of people
___Not applicable

33. Comments:

THANK YOU FOR YOUR COOPERATION

Please return your completed questionnaire to:

Dr. E.W. Auster, Principal Investigator
Department of Educational Administration
The Ontario Institute for Studies in Education
252 Bloor Street West, N752
Toronto, Ontario
M5S 1V6
(416) 923-6641, Ext. 420

Appendix F

SEARCH NO. _______

ANALYST __________

TOTAL NO. OPEN QUESTIONS: _____ (%)

TOTAL NO. CLOSED QUESTIONS:_____ (%)

MEAN PAUSE TIME: ______________

analyst	time	user

analyst	time	user

O = open question C= closed question S= statement R = response P= prompt

Appendix G: Items Used in Scales

PREKNOWL - Extent of Knowledge About Topic Before Search

(a) Have you written any professional papers for publication on the topic of your search in the last five years?

Yes - 2; No - 1.

(b) Have you given any talks or presentations at conferences on this topic in the last five years?

Yes - 2; No - 1.

(c) Have you taken any graduate-level courses on this topic in the last five years?

Yes - 2; No - 1.

(d) Have you taught courses on this topic in the last five years?

Yes - 2; No - 1.

(e) Have you participated in a research project on this topic in the last five years?

Yes - 2; No - 1.

(f) How would you rate the amount of knowledge you had on this topic before the search?

No knowledge - 1; Basic - 2; Moderate - 3;
Advanced - 4; Expert - 5.

IMPORT - Consequences of Missed Information

(a) If your search had missed 10% of the relevant citations, how would this affect the ultimate purpose for which you placed the search?

Not at all - 1; Slightly - 2; Somewhat - 3;
Considerably - 4; Greatly - 5.

(b) If your search had missed 50% of the relevant citations available in the system, how would this affect the ultimate purpose for which you placed the search?

Same scale as (a).

(c) If your search had missed 10% of the relevant citations available in the system, how would you be affected financially?

Same scale as (a).

(d) If your search had missed 50% of the relevant citations in the system, how would this affect you financially?

Same scale as (a).

(e) If your search had missed 10% of the relevant citations, would the project or purpose for which you placed the search be undertaken or completed anyway?

Yes - 1; No - 2.

(f) If your search had missed 50% of the relevant citations, would the project or purpose for which the search was undertaken be completed anyway?

Yes - 1; No - 2.

(g) If 50% of the documents retrieved were irrelevant, who would be most affected?

You only -1; You and your work group - 2;
You and your entire organization - 3;
Larger number of people - 4;
Not applicable - recoded 1 for analysis.

(h) If 90% of the documents retrieved were irrelevant, who would be most affected?

(same scale as (g)

NEWKNOWL - Extent of New Knowledge About Topic After Search

(a) How much did you learn about your topic as a result of the search?

Nothing - 1; Very little - 2; Some - 3;
Quite a bit - 4; Extremely large amount - 5.

(c) How many of the citations retrieved do you plan to read?

0% - 1; 1-10% - 2; 10-20% - 3; 21-50% - 4;
more than 50% - 5.

SATISFAC - Satisfaction with the following aspects of the search

(Satisfaction very low - 1; Low - 2; Moderate - 3; High - 4; Very high - 5.)

LENGTH: Length of bibliography
VALUEB: Value of the bibliography
VALUEM: Value of materials located via the bibliography
CURRENT: Currency (up-to-dateness) of search results
UTILITY: Utility of the search results for your intended purpose
OVERALL: Sum of preceding five items.

Note: Omitted from analysis were satisfaction with helpfulness of search analyst, time taken to deliver bibliography, and price of search.

PART II

THE ONLINE NEGOTIATION INTERVIEW IN TRADITIONAL PERSPECTIVE: A REVIEW OF THE LITERATURE

Introduction

The focus of this study is on the relationship between selected aspects of the negotiation process in online bibliographic retrieval and the ultimate satisfaction of the user with the search outcomes. The negotiation process itself, however, is not a single act but rather a series of complex interactions that may involve the search analyst and the client; the search analyst and the computer system; the search analyst and the user interacting with each other and the computer system. Further, the negotiation process may not only involve various human/machine combinations but is itself a transaction that is comprised of a series of component parts, not all of which need occur to conduct each search and the discrete parts of which still remain ill-defined. In addition, it is not yet clear how, or indeed whether, the negotiation process in online retrieval differs from the more traditional and more fully documented reference interview in the manual search for information. Nor is it clear what elements affect the user's ultimate satisfaction with the search, or how these factors may be separated out, measured, and related to the preceding elements of the search process. Therefore it would seem reasonable in this section of the report to begin by presenting the literature that attempts to describe the online negotiation process in general terms, then summarize those authors who have dealt with the interview in the reference process and finally zero in on the specific aspects of the negotiation interview and user satisfaction that are the focal points of this study.

If we remember that the use of online bibliographic retrieval in libraries is but a decade old, we will not be surprised that the literature in the field is relatively recent and though growing at a rapid rate, as yet not overly abundant. Moreover, though much of it is descriptive, very little is theoretical or empirically based. Perhaps an indication of the growing maturity of the field is the recent appearance of several textbooks that synthesize much of the journal literature.

The Online Search Process

A Brief overview of the nature of the online search process may be had from the following descriptions.

> Seated at a computer terminal, the online searcher is in direct contact, via a telecommunication link, with a remotely located computer system. There, machine-readable files called data bases are stored. These data bases are essentially electronic versions of the indexing and abstracting services familiar to librarians. Through a structured protocol established by the retrieval system and using subject descriptors, key words, and basic Boolean logic, the searcher can examine the contents of the data bases.
>
> (Atherton and Christian, 1977, p. 2)

And,

> An online bibliographic database search involves the direct communication between a searcher and the computer system using a conversational program dialogue. The searcher, using a specific set of predefined commands directs the computer in searching machine-readable indexes for certain information. The searcher, by typing appropriate commands into a terminal, can tap the resources of the entire system.
>
> (Chan, 1981, p. 2)

A personalized view of the actual online interaction is the following:

> You dial a telephone number, not of the search computer, but of one of the network's small computers in or near your city. Treating this computer somewhat as the telephone operator at your friend's office, you "tell" it whom you want to "talk" to--all in code. The network computer then connects you to the appropriate computer, to which you now identify yourself. You do this by giving a password, rather than your name. The password identifies you as a valid user and implies authorization for the search service to bill you for the computer time you are about to use. You will also be billed for the use of the network through your search service. The network in other words, treats the search service as its customer, and the search service resells network services to the consumer...
>
> When your terminal is finally connected to the computer you want to use (networks usually serve many different computer services; connection to the network is not the same as connection to the computer) and you are identified as a valid user, your overhead functions are completed. The actual search begins with you telling the computer what file you want to search. Then, you are ready to begin searching.
>
> (Meadows and Cochrane, p. 13)

These overviews are, of course, succinct summaries of a rather lengthy and complex series of actions that require a host of skills, knowledge, and behaviors on the part of the search analyst. Hoover (1980, p. 197-210) feels that before the planning of a search can be undertaken, the analyst must first have a basic understanding of the equipment, concepts, systems, and data bases to be used. He treats such topics as terminals, telecommunications links, search logic, and the search system before describing elements of interactive communication like system commands, hits or postings, bibliographic records, user aids, organization of a typical data base, controlled and uncontrolled vocabulary, inverted indexing, and data base file structure. Only after these subjects have been introduced and explained in some detail does he feel the searcher has a sufficient background to approach the planning and performing of the search itself. The planning aspect of the online search is all the more important if one is concerned with the costs of online connect time--costs that may either be passed on to the user as search fees or that may be covered by the host organization. Before logging on to the search system, he suggests that several steps be followed:

> Defining the search topic (the reference interview)
> Determining the type of search needed
> Selecting data bases and search terms
> Creating a preliminary search strategy (p. 210)

Having followed these steps fairly rigorously, the analyst may now turn to the performance of the search and the recording and evaluating of the results. While this specific article deals with the mechanics of searching, it is worth noting that it comprises only one chapter in a guide to online services that presents material on other related areas such as producers and vendors of bibliographic online services, promotion, management, measurement and evaluation of online services, the training of searchers, and online user groups, among others.

Other recent treatments of the online search process also give an accurate indication of the complexity of the topic and the various kinds of background knowledge that a searcher must have to execute successful searches. Having acquainted the novice with an overview of the development, growth, and types of databases and online services, Chen launches into the fundamentals of online database searching (1981, p. 13-60). She describes the hardware required including different types of terminals and their unique features and proceeds on to the "basics of searching" briefly explaining the search command options of the DIALOG system and the use of Boolean operators. The commands and operators are illustrated by excerpts of sample searches. The issue of question negotiation is regarded to be of such crucial importance that a separate chapter is devoted to it.

Fenichel and Hogan also separate the chapter of their text devoted to the "nitty-gritty" of performing an online computer search from that describing the negotiation interview which they call "the reference process online style" (1981, p. 67). Although they state that it is their intention to convey to the reader an understanding of the search process rather than to teach the reader to perform searches, they too consider that the presentation of sample searches will best illustrate the concepts they are discussing. Their treatment of the search process covers the statement of the search request, the identification of key concepts, translating the concepts into terms that match the index language of the database, the steps involved in logging on, entering the search terms online, combining terms using Boolean logic, printing references and logging off.

Meadow and Cochrane follow the same general pattern in that they separate out their discussion of the presearch interview from their treatment of the other elements of interactive searching. These elements include connecting the user to the data base, the selection of appropriate search terms or phrases, the use of combinational logic, browsing and printing. Comments on variations in command languages and the cost of online searching conclude this part of their treatment of the basics of online searching (1981, p. 9-24).

Wilks (1982) presents the most recent, comprehensive treatment of what every searcher should know about online searching. His emphasis is not so much on the search process as a series of discrete identifiable steps, actions, or behaviors, but on the detailed explanation of ten specific online interactive commands that he groups into ten functions for

1. logging on and off a particular system
2. housekeeping
3. data file selection
4. browsing the dictionary indexes containing all the searchable terms of a database
5. searching the database itself
6. logical combining of word sets created to refine a search
7. document or citation display, online or offline
8. saving search strategies, including editing of those strategies
9. online document ordering, and
10. carrying out special tasks on a particular system--the special features (p. 37).

He, too, treats the reference interview, as he refers to it, separately though somewhat briefly following it with a set of seven sample searches illustrating different search strategies, databases, and systems. His is a particularly noteworthy addition to the literature because of the use of Canadian examples whenever possible.

From this review of the treatment of the search process in recent standard works, a number of things become apparent. First, a set of standard definitions of the search process does not yet exist. Does the process start when the user submits a search request, when the analyst begins to develop a search strategy, when the searcher logs on to the terminal, or at some other point?

Second, there is no standard, universally used terminology to describe the stages of the search process. One source lists 61 "quasi-equivalent" terms to describe 6 concepts in online bibliographic retrieval (Meadows and Cochrance, 1981, p. 5). While there does appear to be a move toward more standardized usage, the existing diversity still creates problems in comparing different studies and in retrieving relevant information.

Third, the treatment accorded online searching by the recently published texts tends to vary in degree of specificity and emphasis. While some concentrate on very specific aspects of the search so as to constitute virtual procedural manuals, others are more general, providing an overview for the informed observer. Regardless of the approach taken, however, each author recognizes the importance of the negotiation or online reference interview to the search process. A more detailed examination of the negotiation interview in online searching will be undertaken later in this review. But, as has been implied already, the task of assessing user information needs did not arise with the advent of computer technology but stems from a long and well-documented scholarly tradition centering around the reference interview. It is to that literature that we now turn for insight into the elements that contribute to a successful interview.

The Traditional Reference Interview

The reference process involves "interaction between the librarian, the library patron, and the library's resources in order to satisfy the patron's information needs" (Jahoda and Braunagel, 1980, p. 1). One model of the process describes it as a series of decision steps that include the analysis of the user's request so that the subject matter and type of information needed are identified; the refinement of the query for a more complete understanding; the selection of types of answer-providing tools; the location of the answer within a specific title selected; the communication of the answer to the user; the assessing of the adequacy of the answer to meet the user's needs and the possible renegotiation of the query if the results are not deemed to be satisfactory by the user (p. 2-3).[1] While this model of the reference process is one of several that might have been chosen, its importance lies in showing the primary place of the reference interview in determining the success of the steps that follow. It is the first step of the reference transaction and provides the opportunity to discover the inquirer's true information need even if the initial expression of that need is not made apparent. From the earlier examination of what went on across the reference desk by Eleanor Woodruff in 1897, it was recognized that finding out precisely what the user really wanted to know presented a major difficulty (Rothstein, 1977, p. 392). Though calls for patience, approachability, and common sense dot the older references, it was not until the last two decades that the reference interview was subjected to rigorous analysis.

William Katz defines the reference interview as "a dialogue between someone in need of information and someone--the librarian--able to give assistance in finding it" (1982, p. 41). This implies that some accurate communication must take place between the individual with the need and the one with the means of meeting that need. It is this negotiation of the reference question that has been described as "one of the most complex acts of human communication" for "in this act, one person tries to describe for another person not something he knows, but rather something he does not know"(Taylor, 1968, p. 180). This approach focusses on the user's difficulty in being able to express his or her need. Taylor suggests that the inquirer has four levels of information need that must be worked through: first, the visceral need when there is an actual but unexpressed need for information; second, the conscious need when there is a conscious, within-brain description of the need; third, the formalized need when there is a formal statement of the need; last, the compromised need when the question is presented to the information system (p. 182). It is the skill of the librarian to work with the inquirer back from the compromised to the formalized and possibly even to the conscious need and then to develop an appropriate search strategy. Taylor found that experienced information specialists pass reference requests through five "filters" from which they extract data that will aid in the search. These "filters" for structuring the interview are:

1. determination of subject;
2. objective and motivation (of the inquirer);
3. personal characteristics of inquirer;
4. relationship of inquiry description to file organization;
5. anticipated or acceptable answers (p. 183).

Each of these "filters" presented problems that could impede the successful outcome of the search.

Other scholars have alerted the librarian to other problematic areas such as the ambiguity or incompleteness of the query statement, the failure to specify the amount of information needed, the failure to specify the level of difficulty of the possible answer, the constraints imposed by language, time period, place, or type of publication needed (Jahoda and Braunagel, 198C, p. 116-123).

During the past ten years, attempts to come to grips with the difficulties posed by the reference interview led scholars to the areas of verbal and non-verbal communication for explanatory paradigms. Body language or kinesics such as posture, facial expression, hand gestures, eye movement, and head nods were shown to influence the reference interview. For example, facial expression was said to be of importance in indicating "approachability". Leaning forward instead of away from a user indicated interest. Boucher (1976, p. 31) summarized the two extremes that librarians might adopt as the "preoccupation mode" and the "availability mode". The former characterized by arms across the chest, no eye contact, busy hands, bent head sent negative communication signals to the user. The availability mode, on the other hand, evinced by relaxed hands, a smile, willingness to leave the desk, head up, eyes ready to make contact sent the user positive indications that the librarian was prepared to be approached and helpful. Somewhat along the same lines, Gothberg (1976) showed that the immediacy of the librarian's non-verbal communication will positively affect the level of satisfaction of the user with the reference interview. Kazlauskas (1976) confirmed that the positive non-verbal behavior exhibited by librarians such as the use of the eyebrow flash to indicate immediate acknowledgement of the user, the use of nodding to indicate that the request is understood, the use of eye contact and slight smiling all generated similar positive responses from the user whereas negative behaviors inhibited user requests and interaction. Munoz (1977) also devotes attention to the significance of non-verbal communication in the reference interview mentioning physical distance, orientation, physical appearance, posture, head nods, facial expression, gestures, looking, and paralinguistics. She concludes by stating that the reference librarian has

> an obligation to become acquainted with the current research in nonverbal communication ...Nonverbal communication is not just a matter of common sense; the study of it is a scientific enterprise which shows us how to use the various communication modes as conscious techniques. It offers us a means to establish more effective contact between inquirer and librarian (p. 223).

The recognition of the importance of empathy on the part of the librarian led at least two authors to see a strong relationship between the reference interview and counselling and therapy interviews (Peck, 1975; Pierce, 1971). Others (Shosid, 1974; Horn, 1974) turned to the sociological concepts of role and status relationships to point out that conditions in which neither the librarian nor the user know what to expect from each other, where there is a lack of control on the part of the librarian and therefore a need to establish relative status, where the user is defensive about having to seek help and uncertain about the librarian's ability to provide assistance, i.e., typical elements of a reference encounter, all these present barriers to effective role relationships and reference transactions.

The search for explanatory theory though somewhat abated still continues. Gavryck (1982, p. 36) suggests that an exploration of the literature on task groups, group interaction, social penetration theory, and uncertainty reduction theory would help to further illuminate the relationship generated between the librarian and the user during the reference interview and that such insight would better enable the librarian to create a more cooperative atmosphere that would facilitate the flow of information so crucial to a successful search.

While the behaviors and roles of the participants in the reference interview have received considerable attention from some, others have concentrated on the techniques of structuring the reference interview.

Methodologists in the social sciences pointed out the importance of the interview as a research instrument and in their efforts to increase respondent participation, minimize situational determinants, and reduce and control error they identified those characteristics of the question-answer process that would yield reliable, unbiased, valid responses. The "openness" versus "closedness" of the questions and evidence of encouragement, silences, guggles, and interruptions between questions were identified as especially important (Hyman, 1975; Richardson, Dohrenwend, and Klein, 1965). "Open" questions, those prefaced by "what, when, how, who, where, why" occur most frequently at the beginning of an interview and encourage the respondent to answer at length. "Closed" questions begin with words like "is, do, can, will" and call for shorter responses. King (1972) stresses the need for librarians to be good interviewers and advocates greater use of the "open" question to elicit better responses from the user. White (1981) carries the discussion of these types of questions further in her analysis of the dimensions of the reference interview. She suggests that the use of "open" and "closed" questions affects the pace, that is, the speed and efficiency, of the interchange between question and response and that the arrangement or sequencing of the questions may occur in three ways: moving from open to closed questions (the funnel sequence); moving from closed to open questions (the reversed-funnel sequence); and using a series of either open or closed questions (the tunnel sequence). The choice will depend on the amount of information the user has about the topic and the user's degree of articulateness.

From this summary, it becomes apparent that the investigation of the reference process has a long and rich tradition. This tradition has fostered a reasonably clear and generally accepted view of what occurs during the reference interview though why and how it occurs are still matters of interest to investigators. In recent years not only the findings of other disciplines have provided lenses through which to examine the reference interview but their research methods have been used to study the phenomenon with greater accuracy and objectivity. Terminology is not a major issue in this relatively mature field and descriptive models that have been constructed to show the flow of events in the reference process are generally accepted.

The Online Negotiation Interview

While a general overview of the computer-based search process was presented earlier, it remains for this section to examine the online interview itself in somewhat greater detail. First, the online interview will be placed in the context of the broader search process, then specific topics such as negotiation behavior, terminal techniques, and satisfaction measures will be treated.

Recent models of the online search process clearly show the place of the search interview. Briggs (1976), while describing the entire set of interactions between the user and the analyst as the "user interface" creates a model consisting of two major components, pre-search activities represented in the top part of the diagram, and post-search activities represented in the bottom half. These components involve interactive processes that reflected existing user interfaces as they occurred and were documented at real search centres.

Insert Figure 1 Here

A somewhat simpler model was developed by Fenichel and Hogan (1981, p. 68) which described the steps of the online search process in a linear fashion as follows:

Insert Figure 2 Here

Cochrane's (1981) depiction of the process involves the pre-search interview, pre-search staff preparation, search strategy planning, online searching, offline post-hoc analysis and possibly even requestor use of information obtained.

All of these models stress the importance of the online negotiation interview. Occurring in the early stages of the search process, it is the step that allows the search analyst to determine exactly what the user's information needs are and allows the user to learn what the computer can and cannot do for him/her. During this interview the search analyst must negotiate the information request and transform it into appropriate search statements that can be handled by the online system and file. Objectives, choice of terms, search strategy must all be discussed and mutual agreement reached. Meadows and Cochrane lend to our understanding of the presearch interview and the online search by depicting them as a series of steps that occur though not in a fixed order (1981, p. 128). These steps are as follows: (1) Clarifying and negotiating the information need and search objectives. It is now that it is determined whether high recall (retrieving all relevant items), high precision (retrieving only relevant items) or retrieving some relevant items is most important to the user and constraints are identified. (2) Identifying relevant online system and data bases. (3) Formulating basic search logic and planning search strategies. The search topic is analyzed into concepts and plans made for combining these. (4) Compiling the search terms. Thesauri and free-text terms and their sequence are decided upon. (5) Making output choices. Limits are placed on the ultimate form of the printout. (6) Conceptualizing the search as input to the retrieval system. Search terms are arranged into concepts using the features (truncation, word proximity) of the system, concept groups are arranged in order of importance and sequence, output is restricted based on search objectives. (7) Evaluating preliminary results. Search results are reviewed, alternative strategies considered with possible recycling of steps 1-6. (8) Evaluating final results. The user's satisfaction with the results are determined.

In her step-by-step guide to the presearch interview, Somerville (1982) divides the components of the interview into four groups: those common to all interviews, additional components if the user is unfamiliar with online searching, additional components if the user is present at the terminal during the search, components that can be omitted for frequent users. Those elements common to all interviews are: (1) the use of interpersonal communication and negotiation skills; (2) the discussion of the subject with user; (3) the determination whether a computer search is the appropriate way to answer the question; (4) making sure the search analyst understands the question; (5) determining comprehensiveness of the search question; (6) identifying limits; (7) selecting data base(s) or system; (8) identifying additional sources; (9) identifying main concepts and developing search strategy; (10) identifying potential problems; (11) determining alternative strategies; (12) determining citation output; (13) discussing confidentiality; (14) conducting the post-search review. For inexperienced users, information on the benefits and limitations of computer searching, software features, and potential databases would be added. For repeat users, the interview would be briefer with shorter explanations and discussion of online organization, procedures, and search strategy. Among those factors that affect the interview, Somerville lists the location of the user, whether the user is at the terminal during the search, the searcher's knowledge of the subject, the subject specificity, and the searcher's knowledge of the data base.

Other researchers have chosen to study the online interview using more behavioral approaches. Hitchingham (1979) charts user and searcher interaction patterns using the Bales Interaction Process Analysis scheme for observing social and emotional behavior of individuals in small groups. The profiles she constructed were composed of categories representing positive social-emotional areas ("shows solidarity", "shows tension release", "agrees"), neutral task areas ("gives suggestion", "gives opinion", "gives orientation", "asks for orientation", "asks for opinion", "asks for suggestion"), and negative social-emotional areas ("disagrees", "shows tension", "shows antagonism"). Not surprisingly, perhaps, she found that the information-giving activity by searchers is most striking and that searchers showed higher levels of giving suggestions and opinions while users predominated in the agreement category.

Fidel (1981), using the case study method, constructed a pattern model of searching styles which she labelled operationalist and conceptualist. According to her, operationalist searchers seemed to base their search formulations and interactions mainly on the manipulative power provided by the systems. Operationalists

> "understand" a request by translating it into search statements. They use the thesaurus as the main source for clarification and frequently as the only one. They usually look for terms submitted by the user; after they find the appropriate descriptors and know the category to which they belong, they are ready to formulate the search. If they cannot find a descriptor to represent the concept, they do a free-text search of the original terms (p. 69).

Conceptualist searchers seem to formulate and modify their searchers mainly by performing conceptual analyses. Conceptualists

> "understand" a request by fitting it into a conceptual structure (e.g., faceted structure). In order to identify the different elements of the structure they may need information that was not provided by the user, and they use all the sources available to them (e.g., professional dictionaries) to acquire this information. They persistently search for descriptors to be incorporated into the initial search formulation; they may use broader or related descriptors to represent an element in the conceptual structure if a specific one cannot be identified. During the formualtion process they decide which elements of the conceptual structure are most important for the specific request, and they investigate these thoroughly. Most often the preparation continues after logging on, and some planning is performed online (p. 68-69).

Fenichel (1980) examined the relationship between searching behavior and searcher experience with the ERIC database. Her results showed that novices performed surprisingly well though moderately experienced searchers with ERIC experience performed the briefest, most cost-effective searches (measured as time per citation retrieved). She found that there was enormous individual variability in searching behavior and startling simplicity in a large portion of experienced subjects' searches. Once formulated, the initial search strategy was not modified in half the searches, and only the most basic techniques of selecting and combining terms were used. Low recall often resulted because obvious synonyms were not used.

In her study of the behavior of search analysts in presearch interviews, Cochrane (1981) itemized all those tasks that other researchers had reported took place during the presearch interview. The resulting typology of tasks fell into six areas:

1. Descriptive and tutorial tasks
2. Request clarification tasks
3. Request negotiation tasks
4. Vocabulary construction tasks
5. Search strategy tasks
6. Other activities (administrative, diversion, etc.)

(p. 4)

Specific tasks were listed under each area and the typology was used as the checklist to encode and analyze data from videotapes and audiotapes collected of presearch interviews. "Request clarification" was shown to occur most often as the first event of the interview while "other activities" was most often the last. There was no statistically significant relationship between either the librarian or user satisfaction scores and the occurrence of the professional tasks listed above.

Elsewhere Cochrane (nee Atherton) presents a checklist of possible social interaction behaviors that may be exhibited by both the search analyst and the user (Atherton and Christian, 1977, p. 53; Atherton and Jensen, n.d., p. 14). It may be seen from Table 1 that the positive and negative occurrences that she lists have their roots in the literature of interpersonal communication that formed the explanatory framework for a substantial portion of the work on the traditional reference interview. Further parallels between the role of the librarian in manual and online searching have been drawn by Knapp (1978), Hammer (1981/82), and others concerned with the interview process as interpersonal transaction.

Insert Table 1 Here

In reviewing these treatments of the online interview, it becomes obvious that the interview may sometimes include activities that take place at the terminal, especially if the user is present when the search is entered. It is also true that measuring satisfaction often depends upon the appropriateness of the search output which is a direct result of the search techniques of the analyst. Therefore, this review will now focus briefly upon recent conceptualizations of the search strategy. Detailed discussions of this topic appear in such journals as Online, Database, Online Review; in recent texts (Chen and Schweizer, 1981; Fenichel and Hogan, 1981; Jahoda and Braunagel, 1980; Katz, 1982; Meadows and Cochrane, 1981). For further references, readers are referred to recent bibliographies (Hall, 1977; Hall and Dewe, 1980; Hawkins, 1982) and reviews of the literature (Bates, 1981; Bellardo, 1981; Fenichel, 1980-81; McCarn, 1978) and volumes of the Annual Review of Information Science and Technology.

Discussions of "search strategy" vary in comprehensiveness and specificity. For Chen and Schweizer (1981), the development of the search strategy occurs once the interview is completed and involves first and foremost the identification of concepts. The search analyst would develop the search strategy as follows: (1) Define the search by determining the scope and type of information needed by the user. (2) Define the main subjects of the search. (3) List the search terms to be used. (4) Develop the search profile using selected terms and Boolean operators. (5) Conduct the search. (6) Review the search results. (7) Revise the search. (8) Print citation online or offline (p. 64). For Meadow and Cochrane (1981), search strategy is also defined as "a concept that several steps and levels of work in online bibliographic retrieval" (p. 133). They define a search strategy as a series of decision points that the analyst must make before going online, while online, after the information need has been clarified, negotiated, and search objectives established. Decisions to be made before going online include determining the order in which concepts will be searched online; choosing terms and their forms to represent the concepts; deciding on system features to satisfy search objectives. While online the analyst must decide how to react to unfavorable preliminary results and how to revise the search logic for improved results.

Bates (1981) prefers a narrower definition of "search strategy." She uses the term "search mechanics" to describe the operations or methods for accessing a data base or search service including means of logging on and off, use of Boolean logic and commands. "Search formulation" she uses to apply to the search statements that express the search topic of a request--what many searchers have referred to as their "search strategy" for a specific topic. "Search profiles" describe the subject interests of an SDI subscriber. Finally, "search strategy" to Bates means "an approach to or plan for a whole search. A search strategy is used to inform or to determine specific search formulations decisions; it operates at a level above term choice and command use." (p. 142) It is this latter definition that will be applied here.

Wilks sees search strategy development as an inverted pyramid "with broad concepts or subjects of interest listed first and the more specific modifying concepts, narrowing the search to produce one specific concept" (1982, p. 139). Figure 3 below illustrates this notion.

Insert Figure 3 Here

Perhaps the most quoted models of the types of search strategy development are those of Charles Bourne and his associates.[2] They classified search strategies into five types with the first type used most often. Using the "Building Block" (Figure 4) approach the search analyst divides each search into its component concepts, carries out a minisearch for each concept, and combines the result of each minisearch to obtain a final result.

Insert Figures 4, 5, 6, 7 Here

In the "Successive Fractions" approach, the search analyst begins by retrieving a large set of a general topic and then intersects specific concepts with the large set until it has been reduced to the desired size (Figure 5).

Employing the "Citation Pearl Growing" approach, the search analyst begins with a known relevant citation, reviews the index terms that were used to retrieve that citation (the "pearl"), then recycles these terms as search statements to retrieve more references that are similarly appropriate (Figure 6).

The "Most Specific Facet First" approach involves beginning a multi-concept search with the concept that is most specific and ending the search if the first set retrieved is satisfactory (Figure 7).

The "Lowest Postings First" is similar to the previous approach in that it involves beginning the search with the concept that has the fewest postings and terminating the search if the initial retrieved set is acceptable (Figure 7).

Hawkins (1982) discusses the pros and cons of each approach and he suggests one of his own that he calls "interactive scanning". The search analyst begins by using a broad concept that will retrieve a large set. Then thesauri and other user aids are consulted and the appropriate terms and codes are entered to obtain another large set. This wealth of information is scanned for subject information and alternative strategies are developed and entered as are additional synonyms until a final result is obtained. He recommends this approach as being effective for high recall searches.

At a more specific level, Bates (July 1979) introduces the concept of a search tactic or "move made to further a search". She distinguishes between four types of tactics: those that keep the search on track (monitoring tactics); those that facilitate movement through file structure to the desired file or information source (file structure tactics); those that help in constructing the search formulation (search formulation tactics); and those that help in selecting and revising specific terms that comprise the search formulation (term tactics) and gives examples of each. She also presents "idea tactics" that are meant to generate new ideas or solutions to search problems by improving the search analysts' creative processes (September 1979).

As one moves from abstract conceptualizations and models to the actual performance of the search at the terminal, the literature of practical advice to the search analyst becomes far more abundant. Examples might include journal articles on broadening or narrowing search strategy (Warden, 1977); checking search results to improve searching (Marshall, 1980); editing and formatting search printouts to achieve a more readily understandable product (Huleatt, 1979), and many, many more.

Measuring Satisfaction

Of course the ultimate objective of the online search is to fill the information needs of the users so that they are satisfied with the result. That seemingly simple statement gives rise to a host of issues. The questions of what to measure, how, when, and for what purpose come to mind immediately. Earlier evaluation studies measured the nature and volume of online use--who used the service, which data bases were used, how many searches were performed. Data bases themselves were the subject of much study with F. W. Lancaster contributing perhaps the most used variables to estimate effective information retrieval, precision and recall. Because charges were inherent in online searching, cost studies that tried to determine such things as the average cost per search, per citation, per data base abounded. According to Hitchingham (1977), some of the variables included in efforts to determine costs by investigators like Elman (1975), Benenfeld (1975), Wanger (1975), Cooper and de Wath (1976), and Elcheson (1978) included computer connect time, terminal costs, communication costs, off-line prints, overhead, and salaries. There is still no general agreement either on which of these items should be used to determine cost or what proportion of the costs incurred should be passed on to the user. While commercial information brokers may charge at a rate that ensures a profit, and university libraries may charge for direct costs generated by the search, public libraries are reluctant to pass on full costs to patrons who have been traditionally served free of charge. Studies by Summit and Firschein (1976) and Lynch (1982) comprehensively document the financial aspects of online searching in public library settings.

But these administrative aspects of online usage were not the only areas that were measured. If the time online was to be measured in terms of dollars and cents, then it was obvious that searcher efficiency was an important element. So data was sought on what constituted an efficient search, the influence of searcher education, background, experience, familiarity with data bases and systems used, subject expertise, decision-making ability, personal traits, environment factors and so on.

Not only did what to measure present problems, but how such measurement was to be achieved proved equally difficult. Since most of those involved in providing the service were practicing librarians with full work loads, the amount of information to be collected about the provision of the search service had to be carefully controlled so as not to overwhelm staff with added paperwork. Understandably, the information deemed to be most important was that providing statistics for administrative purposes. Though such information was valuable it was highly dependent on local conditions and did not meet the more rigorous requirements of data collected for scientifically designed studies. Mick and his colleagues (1980) lament the lack of usable user studies. Instruments to collect information might include any combination of the following: online search logs, user request forms, appointment books or calendars, reference interview records, vendors' invoices, monthly statistical sheets, videotapes, audiotapes, observation, user evaluation forms, surveys, and questionnaires. Needless to say, there was no uniformity among the instruments themselves. Nor was there any way to insure that users would either return their forms or fill them out accurately if they did. Hitchingham (1977) has suggested four categories of questions to be included on user feedback forms: user characteristics questions such as how the user learned about the service, what other sources were consulted; performance questions relating to precision and recall, comparison with manual searches, interview techniques, turnaround time; value statements about the overall evaluation of the service; and questions about format and support features. Hoover (1977), Fosdick (1977), and Tagliacozzo (1977), provide sample user evaluation questionnaires and the findings of their research on user satisfaction. Kobelski and Trumbone (1978) report that the overwhelming percentage of users in the studies they analyzed reported that they were satisfied with their search, a finding which raises questions not only about the level expectations and sophistication of current users but about the discrimination power of instruments used to measure their satisfaction.

As Tessier and her associates (1977) pointed out these studies took as their focus the user's satisfaction with the search output. Such concentration for these researchers represented an oversimplification and they postulated that at least four aspects of computer-based retrieval situations contribute to user satisfaction: the output, the interaction with the intermediary, the service policies, and the library as a whole. Further, they viewed satisfaction as a state of mind experienced (or not) by the user. It encompassed both intellectual and emotional aspects and is affected by the expectations which the user brings to the search process, how well the output of the search fits the user's preconceived requirements, and whether the solution falls within an acceptable range. In her subsequent work Tessier (1981) concentrated on satisfaction measures in presearch interviews since it was at this stage of the search that behaviors and tasks would be performed by the search analyst that would affect the ultimate success of the search. Not surprisngly, she found few discussions or scales for measuring subjective interview success. From those she did identify by Carmon (1975) and Briggs (1976), Hitchingham (1979), Gothberg (1974) and Hecht (1979) she concluded that measurement of interview success required a set of questions rather than a single question, that summing the responses for all questions for a given person improves the reliability of the measure, that interview satisfaction is multi-dimensional being comprised of both task and socio-emotional components, that interview satisfaction is a rather insensitive dependent variable.

> From the literature then, the conclusion was drawn to develop a multiple question questionnaire. The questions, taken together, should be varied in content to tap the dimensions of satisfaction identified in the literature. Also, the questions from previous studies should be used as far as possible, in order to allow cross study comparisons. Tne issue of insensitivity would be addressed by multiple questions, scale construction to enhance variablity, and administration procedures, but not by quota sampling (1981, p. 4).

On the whole, however, her study is more interesting for her identification of interview dimensions than for the strength of her findings. There was a lack of significant relationship between situation variables and user satisfaction while the pattern of correlations to librarian satisfaction show concern by librarians for issues such as charging, use of forms, and presence of the user at the search. Librarian satisfaction was not affected by user characteristics or query characteristics.

In another part of the same large study, Genova (1981) returned to the concerns of earlier researchers who had studied the traditional reference interview nonverbal behaviors--in this case focussing on postural shifts, facial cues such as laughter, eye contact and glances, and hand and head movements. The findings are largely inconclusive and relate behavior to user satisfaction with the interview but not the final outcome of the search.

Conclusion

This review began by suggesting that a study of the online negotiation process and its relationship to the ultimate satisfaction of the user grows out of a set of topics, which though closely related, nevertheless, have their own research emphases and literatures. It was pointed out that the online search process in libraries is barely a decade old and that our understanding of it is still expanding and deepening. Definitions are plentiful though sometimes contradictory, empirical studies are increasing but difficult to compare, method of data collection and analysis are widely divergent and too often dependent on local conditions to be readily generalizable.

The negotiation interview was shown to stem from a long scholarly tradition that examined the reference interview in manual searching. The theoretical and methodological frameworks that formed the bases of these studies stemmed from the social and behavioral sciences especially those dealing with communication theory, group interaction, verbal and nonverbal behavior. While early studies of online services tended to concentrate on financial and other administrative aspect of the service, more recent investigations have again returned to some of these areas for clues to the ingredients of user satisfaction. Research that has studied user satisfaction with the output of the search, and that which has focussed attention on the elements of the presearch interview are both available. It remained for this study to link some of the areas that have been recognized as being important by concentrating on specific behaviors exhibited by the search analyst (pauses, open and closed questions), and their relationship with the satisfaction of the user using techniques of the social and behavioral sciences that have been shown to be effective.

NOTES

1. Other models of the reference process appear in Bunge, Charles A. Reference service in the information network. In Joseph Becker (Ed.), *Conference on interlibrary communications and information networks, Airlie House, 1970*. Proceedings. Chicago: American Library Association, 1971, 109-116. Also Jahoda, Gerald, and Olson, Paul E. Analyzing the reference process, *RQ*, 1972, *12*, 148-156. Katz, William A. *Introduction to reference work*. Vol. II. (3rd ed.). Toronto: McGraw-Hill, p. 108.

2. Based on the earlier unpublished work of C. P. Bowne, B. Anderson, and J. Robinson, descriptions of these models are given in Buntrock (1979, p. 12-13), Fenichel and Hogan (1981, p. 71-74), Hawkins and Wagers (1982, p. 18-19, the source of the Figures 4-7 above), and Meadow and Cochrane (1981, p. 136-139).

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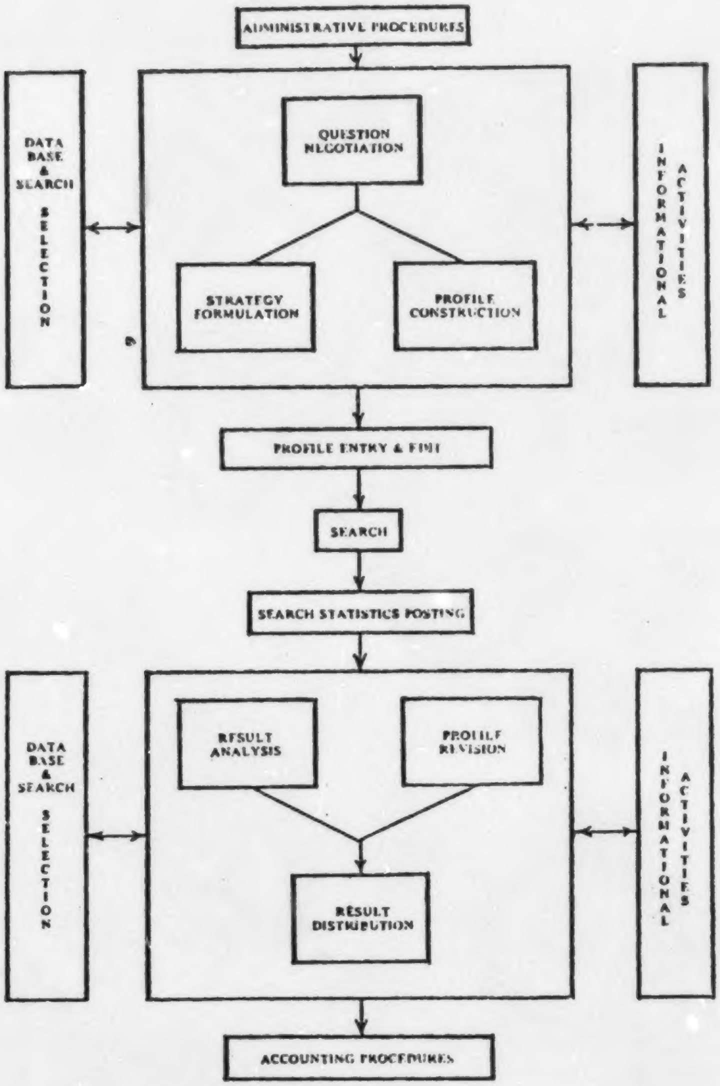

ADMINISTRATIVE PROCEDURES
DATA BASE & SEARCH SELECTION
QUESTION NEGOTIATION
STRATEGY FORMULATION
PROFILE CONSTRUCTION
INFORMATIONAL ACTIVITIES
PROFILE ENTRY & EDIT
SEARCH
SEARCH STATISTICS POSTING
DATA BASE & SEARCH SELECTION
RESULT ANALYSIS
PROFILE REVISION
RESULT DISTRIBUTION
INFORMATIONAL ACTIVITIES
ACCOUNTING PROCEDURES

Figure 1. Model of Existing User Interface

Source: Briggs, R. Bruce. The user interface for bibliographic search services. Proceedings of the Clinic on Library Applications of Data Processing, University of Illinois, 1975: The Use of Computers in Libraries. University of Illinois, Graduate School of Library Science, 1976, p. 73.

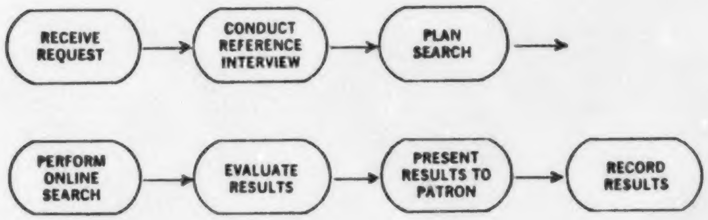

RECEIVE REQUEST
CONDUCT REFERENCE INTERVIEW
PLAN SEARCH
PERFORM ONLINE SEARCH
EVALUATE RESULTS
PRESENT RESULTS TO PATRON
RECORD RESULTS

Figure 2. Overview of the Online Search Process

Source: Fenichel, Carol Hansen, and Hogan, Thomas H. Online searching: a primer. Marlton, N.J.: Learned Information, 1981, p. 68.

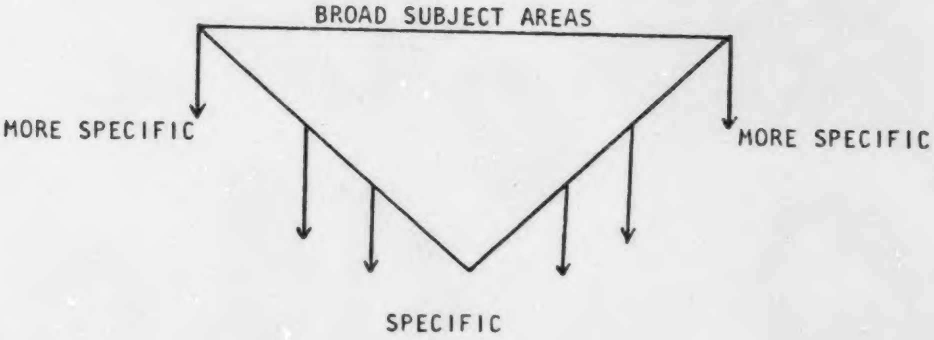

BROAD SUBJECT AREAS
MORE SPECIFIC
MORE SPECIFIC
SPECIFIC

Figure 3. Search Strategy Pyramid

Source: Wilks, Brian. What every librarian should know about online searching. Ottawa: Canadian Library Association, 1982, p. 139.

Figure 4

Building Blocks

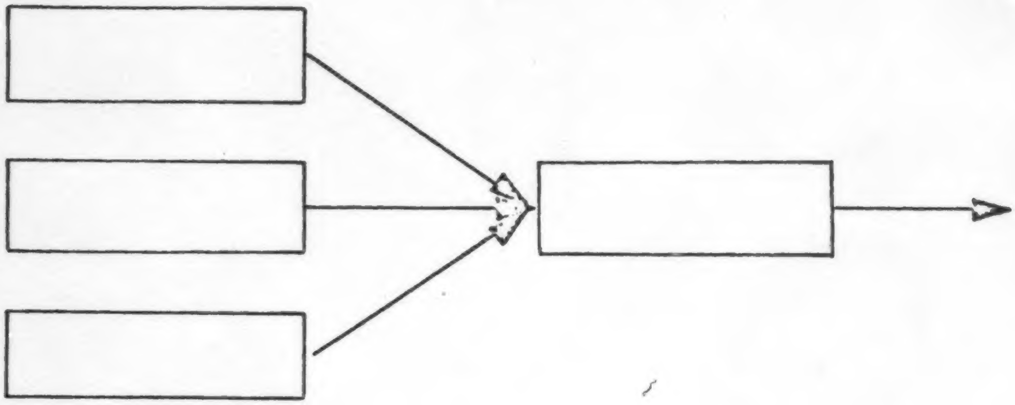


Figure 5

Successive Fractions

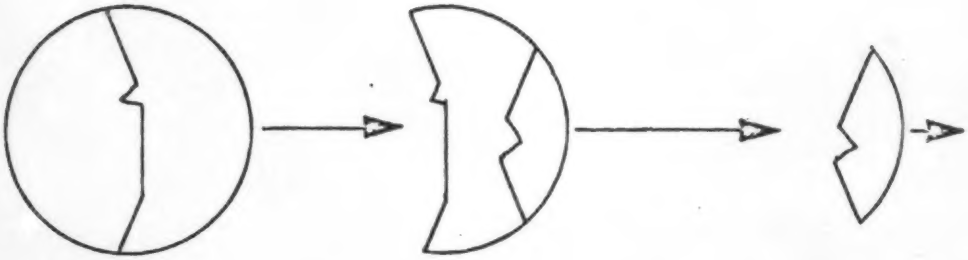


Figure 6

Citation Pearl Growing

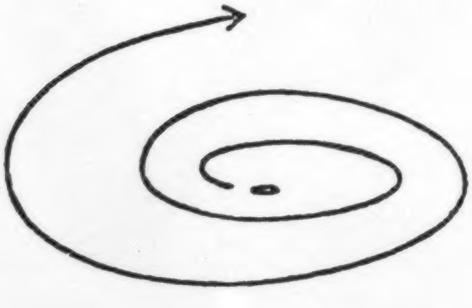
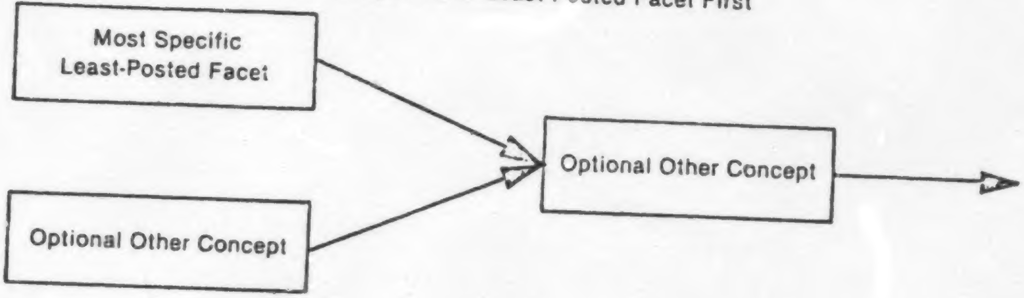


Figure 7

Most Specific or Least Posted Facet First


Most Specific
Least-Posted Facet
Optional Other Concept
Optional Other Concept

Source: Hawkins, Donald T., and Wagers, Robert. Online bibliographic search strategy development. Online, May 1982, p. 18-19.

TABLE 1

CHECKLIST FOR OBSERVING INTERPERSONAL COMMUNICATION DURING PRE-SEARCH INTERVIEW

INFORMATION SPECIALIST				USER
		Positive Occurrences		
Initially, used open questions				Freely stated information need
*Encouraged discussion				
Answered questions in understandable way				Asked questions freely
Thoughtful pauses before answering				
Summarized or paraphrased request				Appeared confident in skill of information specialist
Listened to user				Listened to information specialist
*Gave full attention				*Gave full attention
Remained objective about subject of request				
Appeared comfortable and relaxed				Appeared comfortable and relaxed
		Negative Occurences		
Initially, used closed questions				Had to be prompted to give information
				Changed topic often
				Showed indecision about choices
*Interrupted or talked-over often				*Frequently interrupted or talked-over
Gave command or directives, expecting compliance				Objected to suggested strategies
Attempted to demonstrate superior				Exhibited insufficient knowledge about subject
*Placed user on defensive				*Placed information specialist on defensive
*Gave erratic attention				
Reacted subjectively to request				
Exhibited uneasiness				Exhibited uneasiness
Appeared competitive				Appeared competitive
Appeared submissive				Appeared submissive
Ended interview prematurely				Terminated interview prematurely
Seemed annoyed				Seemed annoyed

Source: Atherton, Pauline, and Jensen, Becky. Interfaces in computer-based bibliographic searching. Syracuse, N.Y.: n.d. p. 14.

PART III

ONLINE NEGOTIATION TECHNIQUES AND USER SATISFACTION: IMPLICATIONS FOR TRAINING SEARCH ANALYSTS*

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ABSTRACT

Previous research has suggested that in the interaction between the user with his/her knowledge and understanding of his/her information needs, and the search analyst, with his/her understanding of the retrieval system and data bases, lies the key to understanding why some searches are more successful than others. In our research, we have conducted a series of experiments in order to determine the relationship between interview techniques, knowledge gain, and user satisfaction with the references retrieved. This paper is a preliminary exploration of the effects of two interview techniques: the conscious use of "open" and "closed" questions and the use of pauses of different lengths by the search analyst during the online negotiation interview.

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INTRODUCTION

The development of online bibliographic search services, which provide the possibility of conducting automated library searches, is one of the most important revolutions which has occurred in library science in the past decade (Wanger, et al., 1976). These automated search services provide an alternative to the labor-intensive process of manually locating bibliographic citations in indexes such as Psychological Abstracts, ERIC, and Social Sciences Citation Index. But, unlike other innovations in library automation that have affected mainly technical services (e.g., computerized cataloguing, circulation systems, etc.), online bibliographic services affect the relationship existing between the library user and the library materials. Instead of direct access to the indexes, the user of an online bibliographic service typically has intermediaries between him/herself and the materials: a search analyst (usually a specially trained reference librarian), and the computer system itself. The analyst must comprehend the search request and devise an appropriate search strategy, keeping in mind the needs of the user, the capabilities of the system, and the constraints of the service. The system largely determines the type of information that may ultimately be retrieved, the limits within which the search may be made, the format of the bibliography retrieved and printed, and the cost of the search.

In this paper, we are concerned with the first of these intermediaries, namely the search analyst, with special attention given to how various interview techniques used by the analyst can affect search results and user satisfaction. Obviously, inadequate communication between the user and the search analyst can result in the development of an inadequate search strategy which fails to retrieve bibliographic citations relevant to the user's concern (Atherton and Christian, 1977). Hence, the ability of the search analyst to elicit pertinent information from the user and to convert this information into an appropriate search strategy must be viewed as an extremely important skill.

METHOD

In the research reported here, we undertook a series of experiments that looked closely at the role and behaviour of the search analyst in order to determine the relationship between the interview techniques that were utilized and the user's level of satisfaction with the quality of references retrieved. To do so, we obtained the assistance of two volunteer search analysts at different Canadian university libraries who expressed an interest in participating in the study. They underwent a one-day training session to become familiar with the interview techniques that we wished to explore before beginning the controlled experimental interviews.

Because of the difficulty of trying to employ several techniques in the same interview, the search analysts were asked to experiment with one technique at a time. Specific techniques to be investigated included:

"open" vs. "closed" questions, and the use of pauses of different lengths to stimulate the client to elucidate his information need. Open questions refer to those open-ended questions which require more than a few words for an adequate response, whereas closed questions can be adequately answered in a few words (identification of person, place, number, etc., or a yes-no response). Pauses refer to those periods during which the interviewer waits without speaking for the user to begin speaking or continue speaking. Both question type and length of pause have been identified by Richardson (1965) as being related to the quality of interviewee response, and were also noted in exploratory studies of negotiation interviews undertaken by Auster and Lawton (1979).

Open questions were expected to stimulate responses which had greater breadth and depth than those for closed questions. It was believed that these extensive responses to the open questions would tend to provide a more valid map of the user's problem area than would responses to the closed (identification, selection, yes-no) questions. In other research, it was found that the use of pauses in the interview tended to have an effect on the user's participation in the interview process, with shorter pauses (under 10 seconds) stimulating deeper participation by the user, and longer pauses (over 10 seconds) inhibiting greater participation (Richardson, 1965). We expected the same results in the research being reported here.

As a control for each of the experiments, a series of 15 'naive' interviews were conducted by each analyst before they were trained in the four techniques (i.e., open question, closed question, short pause and long pause). Fifteen interviews were then carried out for each of the two levels of the open/closed, and short pause/long pause variables. Hence, a total of 75 interviews were conducted by each of the two analysts, yielding a sample size of 150.

The order in which the interviews of each of the four types were done was chosen in a random fashion, so as to ensure that any systematic trends that might develop were removed from the treatment effects. The naive control interviews were conducted prior to any training or exposure to the four experimental techniques, since it was believed that any such training would likely alter the search analysts' behaviour.

Users were screened so that only those seeking retrospective subject matter searches in the social sciences were included. Any given user was included only once in the study. It was expected that other user traits (experienced or inexperienced; student or professional, etc.) would be randomly distributed among the sample. We recognize that these traits may in fact not be randomly distributed, but there is no practical mechanism for controlling these variables experimentally.

All search interviews were recorded on audiotape and later analyzed to ensure that the proper experimental technique had been administered. Quantitative measures of the number of open and closed questions and mean pause time were employed for use in the data analysis phase of the research. Follow-up questionnaires were also conducted after the user had received his/her computer print-out of bibliographic citations. These questionnaires were designed to determine the extent to which the user was satisfied with eight different aspects of the search process, including the helpfulness of the search analyst, the usefulness of the bibliography, the currency of the search results, and the cost. All eight factors were then combined to form an overall index of user satisfaction that was also used in the data analysis phase of the study.

Statistical analyses consisted primarily of two one-way multivariate analysis of variance with blocking on the search analyst. Stated another way, we used a two-way analysis of variance where the second factor was "search analyst". In that way, variation in the dependent variable (user satisfaction) due to differences between the two search analysts was removed. Since there were 30 subjects per cell for each of the levels of the experimental variable, it was felt that any appreciable effects of the experimental variables would be statistically significant at the 0.05 level.

Statistically, the null hypothesis to be tested in each case was

$$H_o: \begin{pmatrix} \mu_{c_1} \\ \vdots \\ \mu_{c_j} \end{pmatrix} = \begin{pmatrix} \mu_{A_1} \\ \vdots \\ \mu_{A_j} \end{pmatrix} = \begin{pmatrix} \mu_{B_1} \\ \vdots \\ \mu_{B_j} \end{pmatrix}$$

where μ_{c_1} is the control group mean on the dependent variable i, μ_{A_1} is the group mean on the dependent variable for the first experimental condition (e.g., open question or short pause) and μ_{B_1} is the group mean on the second experimental condition (e.g., closed question or long pause).

At the data analysis stage, we first checked to see how accurate our measure of user satisfaction was, and also how well our search analysts completed their interviews in terms of the proper use of pauses and open and closed questions. With regard to our eight-item scale of user satisfaction, we obtained a Hoyt estimate of reliability equal to 0.79, indicating that our index of satisfaction was quite satisfactory for our intended purposes.

To determine the success of the search analysts in carrying out the various experimental interview techniques we employed analysis of variance, using mean pause time and proportion of questions open as the dependent variables, and analyst and experimental technique as the independent variables. These analyses showed that analyst B, a more experienced search analyst, administered the open and closed question experiments more successfully, while analyst A administered the pause experiments more successfully. As was expected, in the case of both analysts, a higher proportion of interview questions were open, when the interviewers were originally classified as open, longer pauses were evidenced when the interview was classified as "long pause", and shorter pauses were evidenced when the interview was classified as "short pause". This suggested to us that, for the most part, the four required experimental techniques were properly administered by the two search analysts, although the actual proportion of open questions asked by the two analysts were less than originally anticipated, and the overall mean pause time shorter than originally expected.

FINDINGS

As you will recall, the major focus of attention in this paper is the relationship between the four experimental research techniques employed by the two search analysts and the level of user satisfaction reported by the user. The results of this analysis are reported in Tables 1 and 2 presented below. Table 1 shows the effects of the experimental sessions using open and closed questions on user satisfaction level. Here we see that out of a total score of 100, the overall level of satisfaction was found to equal 76.88, with a score of 81.45 for those searches resulting from sessions using open questions and a score of 75.40 for those searches resulting from sessions using closed questions. It should also be noted that the level of satisfaction in the "control" group was lowest of all, with a mean score of 74.73.

TABLE 1

THE EFFECTS OF OPEN AND CLOSED QUESTIONS
ON USER SATISFACTION

	Mean Satisfaction Level (Total=100)	Standard Deviation	N
CONTROL			
Analyst A	70.78	13.78	13
Analyst B	78.40	14.23	14
Mean	74.73	14.28	27
OPEN QUESTION			
Analyst A	78.90	11.53	9
Analyst B	83.75	9.88	10
Mean	81.45	10.68	19
CLOSED QUESTION			
Analyst A	76.43	14.63	7
Analyst B	74.80	10.03	12
Mean	75.40	11.55	19
OVERALL MEAN	76.88	12.70	65

TABLE 2

THE EFFECTS OF SHORT AND LONG PAUSES ON USER SATISFACTION

	Mean Satisfaction Level (Total=100)	Standard Deviation	N
CONTROL			
Analyst A	70.78	13.78	13
Analyst B	78.40	14.23	14
Mean	74.73	14.28	27
LONG PAUSE			
Analyst A	70.50	15.95	5
Analyst B	70.83	13.52	9
Mean	70.73	13.83	14
SHORT PAUSE			
Analyst A	76.68	10.23	9
Analyst B	75.68	12.80	11
Mean	76.13	11.43	20
OVERALL MEAN	74.25	13.25	61

These findings are in agreement with our model outlined above. In other words, it was found that sessions using more open-ended questions in which the user was required to give more detailed and lengthy responses to the analysts' queries resulted in a higher level of satisfaction with the search results.

When one is actually involved in the search process in this manner, it is not surprising that the user feels that she/he has provided as much information as possible for the analyst, so that the analyst can recover relevant citations from the computer system.

A closer examination of Table 1 also shows that in the case of the open question experiments, the level of satisfaction for Analyst B (83.75) was higher than that expressed for Analyst A (78.90). In the case of the closed question sessions, however, the reverse is true, with a higher level of satisfaction evidence for Analyst A (76.43) than for Analyst B (74.80). A possible conclusion that we can make here is that Analyst B may have used open-ended questions more effectively than Analyst A for eliciting information, while Analyst A may have employed closed questions in a more advantageous manner than Analyst B. However, for both analysts, the total level of satisfaction expressed by the user was higher when open questions were being employed. However, it should be noted that the standard deviations are relatively large in Table 1, showing a considerable deviation from the mean in the case of both open and closed questions.

Table 2 shows the effect of short and long pauses on overall user satisfaction. Here, we see that the overall level of satisfaction is 74.25 out of 100, with user satisfaction being higher when short pauses were employed (76.13) than when longer pauses were employed (70.73). The control sessions yielded an overall satisfaction level of 74.73, in between the other scores. These findings are also in agreement with the model that we outlined above. You will remember that we hypothesized that user satisfaction would be higher when shorter pauses were employed and that lower satisfaction would be evidenced when longer pauses were employed, since shorter pauses were expected to cause the user to volunteer more information, whereas pauses of longer duration would cause a feeling of awkwardness and discomfort in the user.

The difference in levels of satisfaction expressed for each analyst was very slight in the course of the pause experiments, with Analyst A receiving a slightly higher score for short pauses (76.68 as opposed to 75.68 for Analyst B), and Analyst B receiving a higher score for long pause sessions (70.83 as opposed to 70.50 for Analyst A). Table 2 shows relatively large standard deviations from the mean in the case of both long and short pauses, and this should be considered when interpreting the mean scores given in the table.

IMPLICATIONS AND CONCLUSION

While these findings reflect only a preliminary analysis of the data collected over the two year period of this study, they do suggest some directions to be considered in the training of online search analysts in negotiation techniques related to the areas we examined. With regard to the use of open questions in the interview process, there seems to be a reluctance on the part of analysts to employ this mode, even after they have been urged to do so. Since there seems to be a significant relationship between user satisfaction and the use of open questions, it would seem reasonable to suggest that training in the use of this technique would be advisable to increase user satisfaction. Further, since a one-day training session increased the use of this mode only moderately, it would appear that more prolonged, concentrated, intensive training opportunities would be desirable. Methods of training might include role playing and analysis of audio tapes and video-tapes of interview sessions to help the analyst learn more effective interview behavior patterns.

With regard to the long and short pauses, some related and additional implications for training might be drawn. Analysts might be made aware of the positive relationship between shorter pauses and ultimate user satisfaction. Since there seems to be a natural tendency toward the use of shorter pauses, it would appear that intensive training to employ this technique is not warranted. However, practice in using this technique in conjunction with open questions might prove to be beneficial in producing a more satisfied user.

Finally, we urge readers to exercise caution in interpreting and applying these findings since this paper is the first report of the preliminary analysis of data. Also, we do not advocate the abandonment of traditional training methods but rather a modification of these to include techniques that have been found to be positively related to user satisfaction.

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PART IV

The Development of Procedures to Analyze the Relationships Among Search Interview Techniques, Information Gain, and Client Satisfaction with Online Bibliographic Retrieval Services.*

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ABSTRACT

A series of controlled experiments were undertaken to determine the relationships among the interview techniques of the search analyst, the knowledge gain of the client, and the client's satisfaction. Techniques investigated included "open" vs "closed" questions, and the use of pauses of different lengths. This paper details the analytical techniques developed to examine the relationships.

INTRODUCTION

The purpose of our research was to undertake a systematic investigation into the relationships among: (1) the techniques used by search analysts during preliminary interviews with clients before engaging in the on-line retrieval of bibliographic citations; (2) the amount of new information gained by the client as a result of the search; and (3) the client's ultimate satisfaction with the quality of items retrieved. In this paper we present a detailed discussion of our research methodologies, with major attention given to the clarification of the research questions initially posed, and the research design implemented in order to provide answers to those questions. Research techniques, data collection instruments, and statistical analyses employed will all be examined in the following pages, in order to provide a comprehensive overview of the research that was undertaken. We begin with a discussion of the research questions initially posed for the study.

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RESEARCH QUESTIONS

In order to gain insight into the relationships among the three factors discussed above--the knowledge of the client, the interview techniques of the search analyst, and the client's satisfaction with the bibliography and materials--we felt it was necessary to formulate specific questions that could be applied to a series of controlled experimental sessions involving the search analyst and the client. Two key research questions were finally posed for this purpose. They are as follows:

1. What are the relationships between various interview techniques employed by the search analyst and the amount of information gained by the client?
2. What is the relationship between the amount of information gained by the client, the value he/she places on this information, and his/her satisfaction with the bibliography and materials?

The first question required that we make four assumptions, which were to be validated during the study. These assumptions are as follows:

1. that the client's responses to questions are related to the type of questions asked;
2. that the search strategy developed by the analyst is closely related to these responses;
3. that the citations retrieved are closely related to the particular search strategy used; and
4. that the information gained by the client is related to the content of the citations retrieved.

We believed that these assumptions were reasonable based on the findings of Auster and Lawton (1979), and Richardson (1965), which provided considerable evidence that interview technique does affect the validity of the response.

The second question carries one implicit assumption; namely, that the client's gain in information is proportional to the reduction in his/her uncertainty. With this assumption, and the analysis of the value of information provided earlier, we inferred that if high value is placed on a small information gain, then the client must have been near the break-even point.

Believing this analysis to be correct, we hypothesized that satisfaction with bibliographic materials retrieved would be positively related to both the value and amount of information gained, with value being more important than amount. This suggested the rank-ordering of satisfaction scores as shown in Figure 1.

		Gain	
		High	Low
Value	High	1	2
	Low	3	4

Figure 1 -- Hypothesized rank ordering of satisfaction scores in relation to the value and gain in information.

PROCEDURES

In order to determine the relationship between the interview techniques utilized by a search analyst and the client's level of satisfaction with the quality of references retrieved, we decided to undertake a series of controlled experiments in which specific interview techniques would be used, and their effects analyzed. Because of the difficulty of trying to employ several techniques in the same interview, it was decided that the search analysts should only experiment with one technique at a time. Specific techniques to be investigated included "open" vs "closed" questions, and the use of pauses of different lengths to stimulate the client to talk. Open questions refer to those open-ended questions which require more than a few words for an adequate response, whereas closed questions can be adequately answered in a few words (identification of person, place, number, etc., or a yes-no response). Pauses refer to those periods during which the interviewer waits without speaking for the client to begin speaking or to continue speaking.

According to the literature, open questions were expected to stimulate responses which had greater breadth and depth than those for closed questions. It was believed that these extensive responses to the open questions would tend to provide a more valid map of the client's problem area than would responses to the closed (identification, selection, yes-no) questions. Also, in other research it was found that the use of pauses in the interview tended to have an important effect on the client's participation in the interview process, with moderate pauses (under 10 seconds) stimulating deeper participation by the client, and no pause (under 1 second) inhibiting greater participation (Richardson, 1965, p. 204). We expected the same results in the research being reported here.

As a control for each of the experiments, a series of 15 "naive" interviews were to be conducted by each analyst before they were trained in the four interview techniques (i.e., open question, closed question, short pause, and long pause). Fifteen interviews were then to be carried out for each of the two levels of the open/closed and short pause/long pause variables. Hence, a total of 75 interviews were planned for each of the two search analysts participating in the study making a total sample size of 150 interviews.

The order in which the interviews of each of the four types were done was chosen in a random fashion so as to ensure that any systematic trends that might develop were removed from the treatment effects. The naive control interviews were conducted prior to any training or exposure to the four experimental techniques, since it was believed that any such training would likely alter the search analyst's behaviour.

Clients were screened so that only those seeking retrospective subject-matter searches were included. Any given client was included only once in the study. It was expected that other client traits (experienced or inexperienced; student or professional, etc.) would be randomly distributed among the sample. We recognize that these traits may in fact not be randomly distributed, but there is no practical mechanism for controlling these variables experimentally.

All search interviews were recorded on audio tape for later analysis to validate assumptions and to ensure that the proper experimental technique had been administered. Additional information was provided by the search analyst on a one-page questionnaire designed to record technical aspects of the search process, such as the purpose of the search, interview time, strategy time, systems used, data bases accessed, number of citations printed, and so forth (see Appendix A).

Follow-up telephone questionnaires were also administered after the client had received his/her computer print-out of the bibliographic citations. If the person could not be contacted by telephone, a copy of the questionnaire was mailed to the address given by the client at the time of the search. These questionnaires were designed to determine the extent to which the client was satisfied with the search process, the usefulness of the citations received, the amount of knowledge gained from the search and the expertise of the client in the area before the search was conducted (see Appendix B).

The search analyst was also requested to submit a copy of the search strategy entered into the computer system in order to generate the desired list of citations. These four pieces of information, (1) the audio tape of the search interview, (2) the questionnaire filled out by the search analyst regarding the technical aspects of the search, (3) a follow-up questionnaire completed by the client concerning his/her expertise in the subject area and the value and outcome of the search, and (4) a copy of the actual search strategy employed, constituted the main sources of data with which we tested our two research questions.

Information contained in the questionnaires completed by the search analyst and client were coded and entered directly into the data file used in the statistical analyses. The taped interview and search strategy, however, required additional analysis before the necessary information could be entered into the data file. In the case of the taped interviews, you will recall, we were interested in determining whether the desired open question, closed question, short pause, and long pause experimental techniques had been successfully administered. To check this, the entire search interview conducted by the search analyst was "mapped out" on special sheets, which enabled us to record the entire format of the interview, including when a question was asked, whether the question was open or closed, when the client responded, the length of the pauses involved, and so forth. For more information on this "mapping" process, see the example given in Figure 2. (A sample of the coding sheet is included in Appendix C.)

The actual content of the search strategy developed by the analyst for on-line use was also required for the validation of assumption one, associated with the first research question. The nature of the decoding that was involved in the analyses of these search strategies is also explained in Figure 2.

The following excerpt is taken from one of the tape-recorded interviews, conducted by a search analyst as a part of this study. Here, we use the excerpt to demonstrate how we analyzed the taped conversation in order to provide data for the various phases of the study. This example, we hope, will clarify some of the questions that might arise in this paper. Each question and response is numbered (1 through 12) to make it easier to follow the analyses involved. The complete search strategy, incidentally, involved eight major concepts and 32 steps.

Tape 67

1. Analyst: Have you ever had a computerised search
done before?
(0 seconds) (closed question)

2. Client: Yes.
(0 seconds) (no pause)

3. Analyst: So you know what you're going to get out of
it; what you're going to get at the end?
(0 seconds) (closed question)

4. Client: Well, what I got before was a series of titles
with some brief descriptions of content.
(1 second) (short pause)

5. Analyst: OK--Would you please tell me a little bit about
your topic?
(0 seconds) (open question)

1 2 3 4 5 6 7 8
6. Client: OK--The topic is the negotiation process between
9 10 11 12 13 14 15
boards of education and teachers--the bargaining
16 17 18 19 20 21 22 23 24
process--and how the goals of the various groups
25 26 27 28 29 30 31
fit into the general framework of what's
32 33 34 35 36 37 38
negotiated. Do the goals affect what's negotiated--
39 40 41 42 43 44 45
and those are formal goals; stated goals.
(14 seconds) (long pause)

7. Analyst: OK. I've never done one (a search) on this, so
this should be interesting--OK, so should I also
put the bargaining...?
(2 seconds) (closed question)

8. Client: Yes, there's also the bargaining component. I
mean teachers negotiate under the bargaining
act--they qualify to bargain with the board of
education.
(1 second) (short pause)

9. Analyst: OK. In here (thesaurus) they have negotiation
agreements and they have negotiation influences.
Have you been through ERIC already?
(0 seconds) (closed question)

10. Client: Yes.
(0 seconds) (no pause)

11. Analyst: Oh good--OK. What one's (descriptors) did you find that were most beneficial?
(0 seconds) (open question)

12. Client: I'm not sure...

The following diagram shows how we "mapped" each taped interview to determine the number of open and closed questions, and the number of short and long pauses. A map for an entire interview shows every question asked and every response given, in addition to the time (in seconds) between questions and responses.

STATEMENT

	Analyst	Pause Time	Client
1.	C	0	
2.		0	R
3.	C	0	
4.		1	R
5.	0	0	
6.		14	R
7.	S/C	2	
8.		1	R
9.	S/C	0	
10.		0	R
11.	0	0	
12.			R

C= closed
0= open
R= response
S= statement

In validating assumption one, we required the total number of words, seconds and major concepts that were contained in responses to open and closed questions. Using the first open question in the excerpt as an example (i.e., #5), we found that there were 45 words, 20 seconds, and 4 major concepts (major concepts are underlined) in the response.

In assumption two, we were interested in determining whether the major terms and concepts used by the client in the description of the topic were actually employed by the search analyst in the search strategy. A close match between the two would provide validation for our assumption. To check on the match, we first listed all major terms and concepts used by the client in the taped interview, such as the three concepts underlined in the excerpt above. We then examined the on-line search strategy and again listed all major terms and concepts. A comparison of the lists provided the necessary base for comparison.

SEARCH STRATEGY EXCERPT:

1. Arbitration, Collective Bargaining, Contracts, Labor Demands

2. Board of Education

3. Secondary School Teachers, Teachers

4. Goals, Objectives

5. 2 and 4

6. 3 and 4

7. 1 and 5

8. 1 and 6

9. 7 or 8

10. Print 9

Terms Used by the Client During the Interview	Terms Used by the Search Analyst in the Strategy
negotiation process	arbitration
*boards of education	*collective bargaining
*teachers	contracts
*bargaining process	labor demands
*goals	*boards of education
	secondary school teachers
	*teachers
	*goals
	objectives

*common terms, used by both client and analyst.

For this second assumption, we also constructed a five-part scale designed to measure the complexity of the search strategy employed by the analyst on-line. The five items in the scale are listed below, along with the resulting figures derived from analysis of the sample search strategy. By adding the five items together, a total measure of search strategy complexity was calculated.

SEARCH STRATEGY COMPLEXITY:

1. Number of terms used = 9
   (all terms are underlined in strategy)
2. Number of operations ("and" "or" and "and not") = 5
   (all operations are circled)
3. Number of major concepts = 4
   (e.g., search statements 1 to 5)
4. Number of steps in the strategy = 10
5. Number of data bases accessed = 1

Total score: 29

Figure 2: Sample of Interview Transcript, Search Strategy and Coding Procedures

ANALYSIS OF RESEARCH QUESTION ONE:

1. What are the relationships between various interview techniques employed by the search analyst and the amount of information gained by the client?

In question one, we attempted to look at the effects of four interview techniques--open question, closed question, short pause, and long pause--on the amount of information gained by the client. Statistical analysis consisted primarily of two-way analyses of variance with blocking on search analyst. In that way, variation in the dependent variable (e.g., information gain) due to differences between the two search analysts could be controlled for.

Since there were 30 subjects per cell for each of the levels of the experimental variable, it was felt that any appreciable effects of the experimental variables would be statistically significant at the 0.10 level. Statistically, the null hypothesis to be tested in each case was:

$$H_0: \mu_C = \mu_A = \mu_B$$

where μ_C is the control group mean on given dependent variable, μ_A is the group mean on the dependent variable for the first experimental condition (e.g., open question), and μ_B is the group mean on the second experimental condition (e.g., closed question).

Before we began the analysis of our data we first checked to see how reliable our information gain scale was. This was accomplished by calculating a Hoyt estimate of reliability, using the computerized LERTAP program (Nelson, 1974). The reliability of the index formed by summing items 12 to 16 (with scoring for item 12 reversed) was 0.50. Scores ranged from 7 to 23 (of a possible 4 to 24); the standard error of measurement was 2.42(see Appendix B).

As was indicated earlier, four assumptions associated with the first research question were also to be validated in the course of the study. In the following paragraphs these four assumptions will be re-stated along with a description of how we attempted to provide the necessary validation.

Assumption one stated that the client's responses to questions asked by the search analyst would be related to the type of question asked. As was indicated earlier, we expected longer, more complex responses to follow open questions and moderate pauses, but it was uncertain as to how strong this relationship might be. To validate this assumption, we decided first to randomly choose 25 open and 25 closed questions in 50 tapes randomly selected from all of the taped interviews conducted by each search analyst. This would result in "double randomization" of our sample questions; first by tape, and second by question within tape. For each of these 100 questions (50 per analyst), we then proceeded to determine the number of words in the response to the given open or closed question, the number of seconds in the response, and the number of major concepts included in the response. Obviously, if responses having more words and concepts, and being of longer duration followed open, as opposed to closed, questions, then our assumption would be validated for type of question asked.

To test the same assumption for short and long pauses, we chose ten cases of long pause and ten cases of short pause from all searches carried out by the two search analysts, and again determined the numbers of words, seconds, and concepts in the response following the given pause interval. Here, we took the ten most extreme cases for each analyst; that is, the five cases with the shortest pauses and the five cases with the longest pauses. No randomization in selection was undertaken for pause responses, since we wanted to see how clients responded when pauses were of moderate length, or absent. Our assumption would be validated if the more complex responses followed moderate pauses.

The second assumption stated that the search strategy developed by the analyst would be closely related to the responses given by the client. In other words, it was expected that the search analyst would employ concepts and phrases used by the client in the interview process in the actual search strategy being created for the on-line bibliographic retrieval service. To validate this assumption, we proceeded to carry out ten case studies (5 per analyst) in which we carefully examined the relationship between the vocabulary used by the client and the discrete terms and concepts employed by the analyst in the final search strategy. Five tapes were randomly selected from each analyst and all key terms and concepts used by the client in his/her description of the topic being searched were recorded.

The final version of the search strategy drawn up by the search analyst and used in the on-line search process was then examined, and all key terms and concepts were again recorded. By comparing the two lists of terms and concepts, we attempted to discover how closely the search strategy corresponded to the description of the search topic that was given by the client (see Figure 2 for more information).

For this second assumption, we also decided to relate the length of the entire interview to the complexity of the search strategy employed, with the belief that more complex search strategies would result from search interviews that required more discussion time on the part of the analyst and client. Complexity of search strategy was based on a five-part index consisting of the following items: (1) the number of key terms used in the search strategy, (2) the number of operations (e.g., "and" "or" and "not" employed to join the key terms together into concepts), (3) the total number of major concepts included in the strategy, (4) the total number of steps in the on-line search strategy, and (5) the total number of data bases finally searched. The rationale behind this index was a belief that more complex bibliographic searches consist of a larger number of terms and concepts that are searched on several different data bases. By correlating the length of time in the total interview with this five-part index, we hoped to uncover another possible source of validation for our second assumption. (More information on the validation of this assumption is provided in Figure 2.)

Assumption three stated that the citations retrieved would be closely related to the particular search strategy used. As a rule, one might expect more complex search strategies to produce bibliographies with higher percentages of hits. Since we could not control for the subject matter searched, and since only one search was conducted for any given request, we concluded that it was impossible to satisfactorily validate this item within the design of the present study.

Assumption four stated that the information gained by the client would be related to the content of the citations retrieved. This assumption was previously validated in an earlier study (Lawton, Auster and To, 1979). Here, clients were asked, "How much did you learn about your topic as a result of the search? (1) Nothing or very little, (2) Some, (3) A great deal" and "How much of the relevant information retrieved was new to you? (1) 0%, (2) 1-10% (3) 10-20% (4) 21-50% (5) more than 50%." These questions measure perceived information gain directly. The fact the path coefficient connecting response to the first of these two items to the client's reported "satisfaction with the value of the bibliography itself" and "the materials located via the bibliography" (coded (1) low, (2) medium, (3) high) was .67, provided construct validation for that item. The second item was highly intercorrelated with the first. While we considered trying to measure information gain from the bibliography directly, we judged such an approach to be impracticable. It would require developing a series of subject matter tests on different topics for administration before and after a search.

ANALYSIS OF RESEARCH QUESTION TWO:

2. What is the relationship between the amount of information gained by the client, the value he/she places on this information, and his/her satisfaction with the bibliography and materials?

In question two, you may recall, we hypothesized that satisfaction with bibliographic materials would be positively related to both the value and amount of information gained, with value being more important than amount.

The first step in the analysis of data was to determine the reliability of the various scales. In several cases, on the basis of item analysis, items included in the questionnaire were omitted from the scale used to analyse the data in order to improve scale reliability.

The various scales and their characteristics are as follows:

Value of information sought: items 25-32 on User Response form (App. B).

Reliability	.69	Standard Error	2.06
Maximum possible	30	Observed	24
Minimum possible	6	Observed	6

Satisfaction with products of search: items 18, 20, 21, 22, 23 on User Response form.

Reliability	.86	Standard Error	1.30
Maximum possible	25	Observed	25
Minimum possible	5		8

Having validated the scales, the next step is to carry out the analysis of data. It is planned to answer question two by using multiple linear regression with either continuous or dichotomous measurement of key variables. Figure 1 suggests the use of dichotomous variables, one for each of the four cells, so that the hypothesized additive effects of the value and amount of information gain can be estimated. However, an analysis using the continuous variables in this form may also be carried out.

CONCLUSION

As the foregoing implies, analysis of the data continues with a completion date anticipated by the end of the summer. We are hopeful that our work will not only provide some answers to questions that have proved inordinately perplexing in the past but will contribute a set of validated items toward to development of a measuring procedure that has proved to be so elusive in the past.

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Search No.:________________
Analyst:____A ____B
Treatment:____[illegible] ____[illegible]
____[illegible] ____[illegible]

APPENDIX A

The Ontario Institute for Studies in Education
Department of Educational Administration

__Search Analyst's Record of Online Search__

1. Name ________________________
2. Address ________________________
____
____
Tel. (   ) ________________________

3. Topic: ________________________
____
____

4. Date (day/mo./yr.) _ _ _ _ _ _ _ _ _

5. Purpose of search:
___Keep abreast of field
___Assignment, term paper, thesis
___Prep., update of bibliography
___Curriculum Development
___Program improvement
___Speech, article, report
___Research/development report
___Browsing
___Personnel recruitment, evaluation
___Policy development
___Other: ________________________
____

6. Contact: ___Walk-in ___Letter ___Phone ___Other: ______________
7. User supplied: ___synonyms ___topic ___other refs. ___none
8. Interview time _ _ _ _min.
9. Strategy time _ _ _ _min.
10. Connect time _ _ _ _min.
11. System: ___SDC ___BRS
___Lockheed ___N.Y. Times
___QL ___Other:______________
___Infoglobe
12. Data base(s): ___ERIC ___SSCI ___Diss. Abs.
___Psych. Abs. ___ECER ___Other: ______________
___Soc. Abs. ___Child Abuse
13. Citations printed online _ _ _ _ _
14. Citations printed offline _ _ _ _ _
15. Price charged: ________
16. User present during search: ___Yes ___No
___Other: ________________________
17. Did user interaction take place during search: ___Yes ___No
18. Requestor's organization: ___School board ___Ministry of Education
___CAAT ___University
___Faculty of education ___Other: ______________
19. Sex: _____Male _____Female

Search No.: ________________
Respondent: ___SA ___User

APPENDIX B

The Ontario Institute for Studies in Education
Department of Educational Administration

__User Response to Online Search Request__

The Social Sciences and Humanities Research Council of Canada has sponsored this inquiry into factors affecting user satisfaction with online retrieval services. The data collected from this user questionnaire will be used only for research purposes. Ultimately, it is hoped that the results will help to improve online services. Please read each question carefully and indicate your response with a check mark: ✓

__Personal Data__

1. Age
___25 or under
___26-35
___36-45
___46-55
___56-65
___over 65

2. Highest earned degree
___None
___Bachelor's
___Master's
___Doctorate
___Other:________________

3. Please indicate your primary professional role or function. (Check one only)
___Administration or supervision
___Teaching
___Research
___Library services
___Private consultant
___Undergraduate student
___B.Ed. or M.Ed. student
___Other master's student
___Doctoral student
___Other

4. How many years have you been in your current position?
___Less than one year
___1 year
___2 years
___3 years
___4 to 6 years
___7 to 9 years
___10 or more years

__Extent of Knowledge About Topic Before Search__

5. Have you written any professional papers for publication on the topic of your search in the last five years?
_____Yes _____No

6. Have you given any talks or presentations at conferences on this topic in the last five years?
_____Yes _____No

7. Have you taken any graduate-level courses on this topic in the last five years?
_____Yes _____No

8. Have you taught courses on this topic in the last five years?
_____Yes _____No

Extent of Knowledge About Topic Before Search (Cont'd)

9. Have you participated in an research project on this topic in the last five years?

_____Yes _____No

10. How would you rate the amount of knowledge you had on this topic before the search?

___No knowledge
___Basic
___Moderate
___Advanced
___Expert

11. Please indicate which of the following sources you had already consulted or searched before conducting the online search.

___Human resources
___Office files, reports
___Prof. organizations
___Libraries and their holdings—journals, books, indexes
___Conferences
___Prof. development days
___Academic, prof. courses
___Curriculum guides, texts
___ERIC materials
___Other

Extent of New Knowledge About Topic After Search

12. How much did you learn about your topic as a result of the search?

___Nothing
___Very little
___Some
___Quite a bit
___Extremely large amount

	Percentage				
	0%	1-10%	10-20%	21-30%	More than 30%
13. Of the citations retrieved that were relevant to your topic, how many were familiar to you prior to this search?	___	___	___	___	___
14. Of the citations retrieved that were relevant to your topic, how many were new to you?	___	___	___	___	___
15. How many of the citations retrieved do you plan to read?	___	___	___	___	___

16. How much additional information do you still desire concerning the topic that was searched?

___Nothing
___Very little
___Some
___Quite a bit
___Extremely large amount

Value Placed on New Knowledge

Please indicate your satisfaction with the following aspects of your search.	Satisfaction				
	Very Low	Low	Moderate	High	Very High
17. Helpfulness of search analyst	___	___	___	___	___
18. Length of bibliography	___	___	___	___	___
19. Time taken to deliver bibliography	___	___	___	___	___
20. Value of the bibliography	___	___	___	___	___
21. Value of materials located via bibliography	___	___	___	___	___
22. Currency (up-to-dateness) of the search results	___	___	___	___	___
23. Utility of the search results for your intended purpose	___	___	___	___	___
24. Price of the search	___	___	___	___	___

Consequences of Missed Information

	Affect				
	Not at all	Slightly	Somewhat	Considerably	Greatly
25. If your search had missed 10% of the relevant citations available in the system, how would this affect the ultimate purpose for which you placed the search?	___	___	___	___	___
26. If your search had missed 30% of the relevant citations available in the system, how would this affect the ultimate purpose for which you placed the search?	___	___	___	___	___
27. If your search had missed 10% of the relevant citations available in the system, how would you be affected financially?	___	___	___	___	___
28. If your search had missed 30% of the relevant citations available in the system, how would you be affected financially?	___	___	___	___	___

29. If your search had missed 10% of the relevant citations, would the project or purpose for which you placed the search be undertaken or completed anyway?

_____Yes _____No

30. If your search had missed 30% of the relevant citations, would the project or purpose for which you placed the search be undertaken or completed anyway?

_____Yes _____No

31. If 50% of the documents retrieved were irrelevant, who would be most a(ffected)?
- __You only
- __You and your work group
- __You and your entire organization
- __A larger number of people
- __Not applicable

32. If 90% of the documents retrieved were irrelevant, who would be most affected.
- __You only
- __Your and your work group
- __You and your entire organization
- __A larger number of people
- __Not applicable

33. Comments:

THANK YOU FOR YOUR COOPERATION

Please return your completed questionnaire to:

Dr. E.W. Auster, Principal Investigator
Department of Educational Administration
The Ontario Institute for Studies in Education
252 Bloor Street West, N752
Toronto, Ontario
M5S 1V6
(416) 923-6641, Ext. 420

APPENDIX C

SEARCH NO. ______
ANALYST ______

TOTAL NO. OPEN QUESTIONS: ____ (%)
TOTAL NO. CLOSED QUESTIONS: ____ (%)

[illegible] PAUSE TIME: ________

analyst	time	user	analyst	time	user

O = open question C= closed question S= statement R = response P= prompt

PART V

OUTLINE OF PROJECT

PREPARED FOR SEARCH ANALYST TRAINING SESSION

I. Purpose

- A. Two questions to be answered
  1. What are the relationships between various interview techniques and the amount of information gained by the client?
  2. What are the relationships between the amount of information gained by the client, the value he/she places on this information, and his/her satisfaction with the bibliography and materials?
- B. Strategy to answer questions
  1. Identify key concepts/variables
  2. Measure the variables
  3. Relate the variables
- C. Key concepts
  1. Interviewer techniques
  2. Information: before, after, and difference (gain)
  3. Value of information
  4. Satisfaction with results
- D. Other concepts
  1. User traits
  2. Search analyst traits
  3. Search content
  4. Data base/system

II. Interviewer techniques

- A. Approaches to measurement
  1. Naturalistic observation
  2. Experimental control

B. Findings of naturalistic research

1. Types of questions vary in terms of the type of response the questionner expects.
    a. Closed questions
        i Identification; e.g., What is your sex?
        ii Multiple choice; e.g., Are you male or female?
        iii Yes-no; e.g., Are you male?
    b. Open
        i Questions that require more expansive answers; e.g., Tell me about yourself.
2. Pace of questionning differs
    a. Rapid fire -- no time to think
    b. Slow -- time to reflect
3. Questions may incorporate assumptions made by the questionner
    a. Leading question -- When did you fire the gun at her? Assumptions: $\underbrace{\text{that you fired the gun}}_{\textcircled{1}}$ $\underbrace{\text{at her}}_{\textcircled{2}}$.
4. Many others

C. Controlled interview experiments

1. Purpose: to establish cause-effect links between type of interviewer technique and interviewer response.
2. Types of experiments
    a. Laboratory experiments
        i Artificial setting maximum control over nuisance variables
        ii May not be valid in real life
    b. Field experiments
        i Low control over other variables
        ii More likely to be valid in real settings
3. Experimental variables used
    a. Closed-open
    b. Pauses: short and long

D. Design of this study

1. Two field experiments
2. Open-closed
3. Short pause vs 10 second pause

III. User Sample

A. Who is in the study?

1. Clients of social sciences (esp. education) search services.
2. Retrospective topic searches only.
   a. No "current awareness" where topic has already been defined.
   b. No special purpose searches--e.g., publication date on a book.
3. Each searcher is in once and only once.
4. All searches negotiated (if not run) in person.
5. Other possible traits are being ignored in the selection process, but may be important, and traits will be noted; e.g.,
   a. Sex
   b. Educational level
   c. Position, etc.
   d. System and data base used
   e. Topic searched

IV. Instruments for Data Collection

A. All data refer to one of the following:

1. Search analyst--characteristics, behaviour, etc.
2. User
3. Search process (e.g., length, strategy, etc.)
4. Bibliography (e.g., no. of items)

B. Sources of data

1. Tapes recording of interviews
2. Copy of search strategy, from printout (preferred) or personal records
3. Search Analysts Record of Online Search
4. User Responses to Online Search Request
5. Biography or vita of search analysts

C. Measurement of variables

1. Experimental variables

   a. Open-closed - research officer taped verification

   b. Pauses - research officer taped verification

   { may use transcripts; may sample by time

   c. We are looking for "on the average" differences of substantial magnitude but not absolute perfection. We are not sure of exactly what is feasible, but suggest that for the subject area negotiation,

      i Open = 70% open questions, 30% closed
      Closed = 70% closed; 30% open

      ii Short pause = 2 sec. ± 2 sec. (0 to 4 sec.)
      Pause = 10 sec. ± 3 sec. (7 to 13 sec.) for 95% of all.

2.* Interviewing variables

   a. Search strategy - analysis of complexity by research officer - no. of terms, no. of conjunctions, etc.

   b. Search characteristics - provided by interviewer

      i Interview time (SA 8)
      ii Strategy time (SA 9), etc.

3.* Information

   i Before - User items #5-11. Scores could be added to form an index which would provide a more reliable measure than any single item.

   ii Gain - User items #12-16. Can form index.

4.* Value of information

   i User #25-32. Can form index.

5.* Satisfaction with search results

   i User #17-24. Can form index

6. All items have been taken from

   i Our previous research

   ii Previous research of others

   iii Developed to fit the concepts we want to measure--reliability increases with the number of items.

* Questions were later renumbered.

V. Conduct of experiments

A. Make sure treatment is given

  1 Validity check to be made by research officer

B. Control "nuisance" variables, if possible - nuisance variables are those that may be related to the variables being studied and that interfere with the experiment. E.g.:

  1. Subjects too heterogeneous - reason why identical white rats are used rather than ten different types of animals. Solution: screen subjects.

  2. Trend in data - e.g., if all "open" interviews were conducted first, and during that period most subjects were students, and if closed interviews we conducted next, and during that period most users were professionals, the difference between results might appear to be caused by question differences, when in fact it was due to different types of clients.

C. Solutions to controlling nuisance variables

  1. Statistical - e.g., compare females with females, males with males; students with students; etc. Too difficult a method in practice.

  2. Randomization - mix it up so that effect of any trends will disappear. That's our choice. Interview treatments have been randomized in order shown on sheet Sequence of Experimental Interview Techniques: A and B.

D. Administration of instruments to users - by mail, phone, and person.

VI. Analysis of Data

A. Basically, compare satisfaction and knowledge gain and other scores for 3 groups for each experiment (control, open and closed; or control, short pause and long pause) while removing the effects due to different interviewers by "substracting" the average difference in knowledge gain and other scores across all interviews. Graphically: